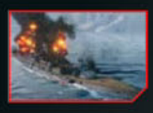

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19 PAGES OF BLENDER PROJECTS

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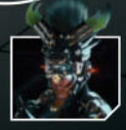

PERFECT MAYA RIGGING
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Utilise ZBrush to craft a terrifying creature

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Create crystal effects
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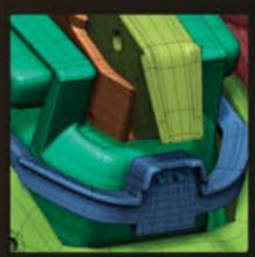

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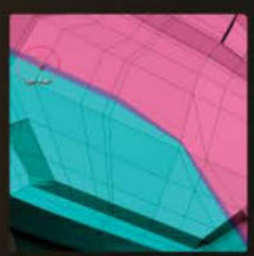

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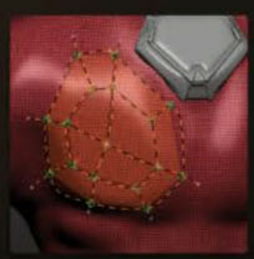

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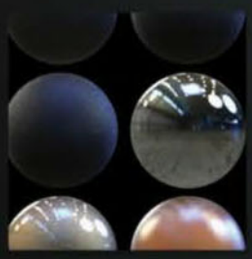

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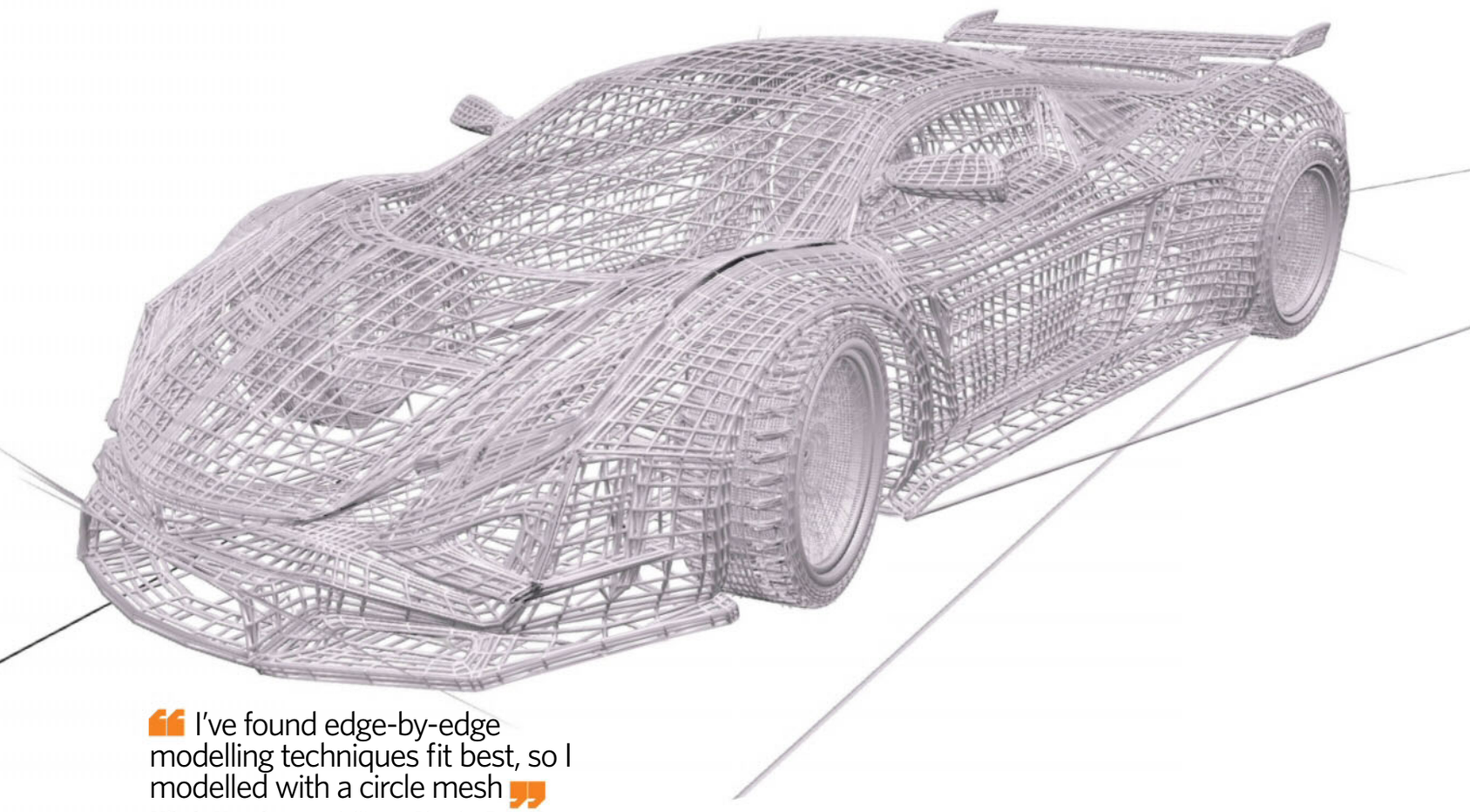
Discover the power of Blender Page 30



“I’ve found edge-by-edge modelling techniques fit best, so I modelled with a circle mesh”

Nikola Novak on modelling in Blender **Page 34**

Create still life with Blender and Cycles **Page 40**

Welcome

To the magazine and 100 pages of amazing 3D

I'm in awe of what the Blender community has accomplished since seeing the trailer for *Cosmos Laundromat* back in May, and so it felt right to take this opportunity to really take a look at just what Blender can do. After all, it's being used by the community to make the pilot chapter of what will eventually be the world's first open source animation feature film, and so my question is this: if you can make a movie with it, what else can you do?

You might be skeptical due to the fact that it's free, feeling that it won't stand up to Maya, 3ds Max, ZBrush and the like – a fair opinion and one that I don't begrudge, but you need only to head to our feature on p30 to find out just how special and versatile it is. We've also had Blender genius Reynante Martinez put together two incredible tutorials for you (p40 and p74) and virtuoso Kevin Hays explains how to create an awesome Blender crystal effect on p72.

We've also taken a fascinating look at how Wargaming is re-creating history in *World Of Warships* by using original schematics as reference material, ZBrush mech tips on p22, a sculpted beast on p56, part two of Jahirul Amin's Maya rigging masterclass on p64 and Matthias Develtere from MachineGames builds a tank in MODO on p68.

Steve Holmes, Deputy Editor

Sign up, share your art and chat to other artists at **www.3dartistonline.com**

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The Expert Panel

This issue's team of pro artists...

REYNANTE MARTINEZ
reynantemartinez.com

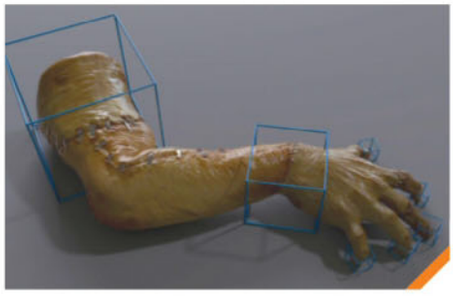
It's likely that you'll have seen some of the incredible work that Reynante has done in Blender and Cycles, and we're really pleased to have him on board this issue for two incredible tutorials.
3DArtist username reynantem

MARIANO TAZZIOLI
mtazzioli96.cgsociety.org

Still as talented and as absurdly young as before, Mariano returns for another mech masterclass in ZBrush, taking you from concept to final render. His tutorial begins over on p48.
3DArtist username n/a

JAMES SURET
zerojs.cgsociety.org

Another return from another phenomenal artist on p56 as James reveals his expert sculpting workflow for creating a terrifying beast in ZBrush, revealing how to model, texture and render his creation.
3DArtist username zerojs



JAHIRUL AMIN
jahirulamin.com

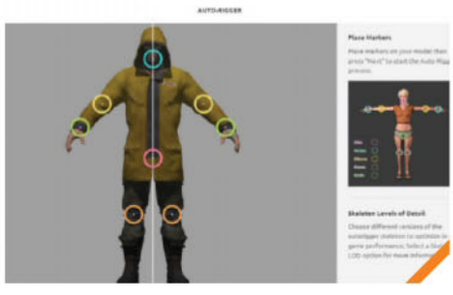
It's great to have Jahirul in the magazine as usual and even better to have him explain his Set Driven Keys wizardry. Rigging can be complex, but learning from Jahirul is your best bet at cracking it.
3DArtist username n/a

MATTHIAS DEVELTERE
develteremattias.wordpress.com

Matthias works as a 3D artist at MachineGames, the studio responsible for the superb *Wolfenstein* games *The New Order* and *The Old Blood*. Check out his tank tutorial on p68.
3DArtist username DevMatt

KEVIN HAYS
jeepster.cgsociety.org

We spotted Kevin's crystal turtle a while back after it caused quite a stir online and desperately wanted to find out how he created such an incredible crystal effect using Blender. He reveals all on p72.
3DArtist username khays



SETH NASH
sethnash.com

Seth has returned this month to cast a critical eye over Mixamo 2.0, the online animation and rigging application that takes the pain out of moving characters. You'll find his review on p82.
3DArtist username n/a

LARISSA MORI
3dartistonline.com

Larissa is leaving us this month after being the voice of **3D Artist** for over two years – we're sad to see her go. Soak up her enthusiasm and knowledge one last time in her Blender feature on p30.
3DArtist username Larissa_3D Artist

ORESTIS BASTOUNIS
twitter.com/mrbastounis

Our favourite tech genius has taken a look at the latest 3D/CAD workstation from Chillblast this month, putting it through its paces in ways we don't understand. His review is on p78.
3DArtist username n/a

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A hand-picked collection of incredible artwork to inspire you

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Discover how the team at Wargaming, the maker of *World Of Tanks*, is re-creating historical vessels from genuine schematics in *World Of Warships*

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Gabriele Maiocco explains his approach to fantasy sculpting in ZBrush, why he analysed shapes and proportions, and chose to not use custom Alphas

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82 Review: Mixamo 2.0
Fresh from being bought by Adobe, Mixamo is analysed by Seth Nash, who delves into the simple functionality of the online character animation tool

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12 Amazing things you can do in Blender

"Blender lets you work very quickly based on quick hotkey actions rather than requiring you to first specify a tool and then perform the action"

Jonathan Williamson on mesh modelling in Blender **Page 32**

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Render still life with Blender and Cycles

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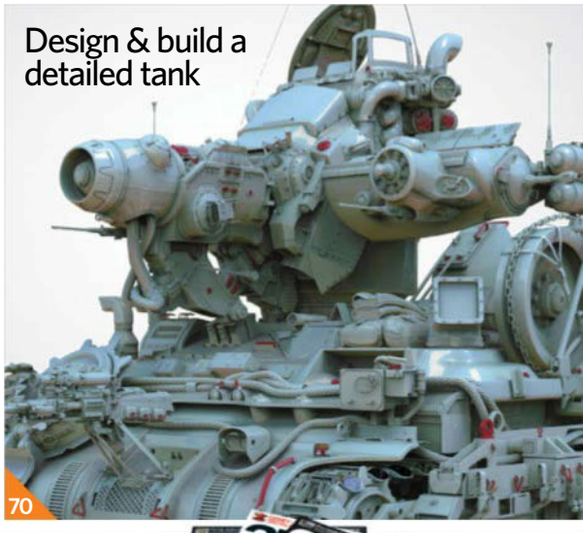

Design & build a detailed tank

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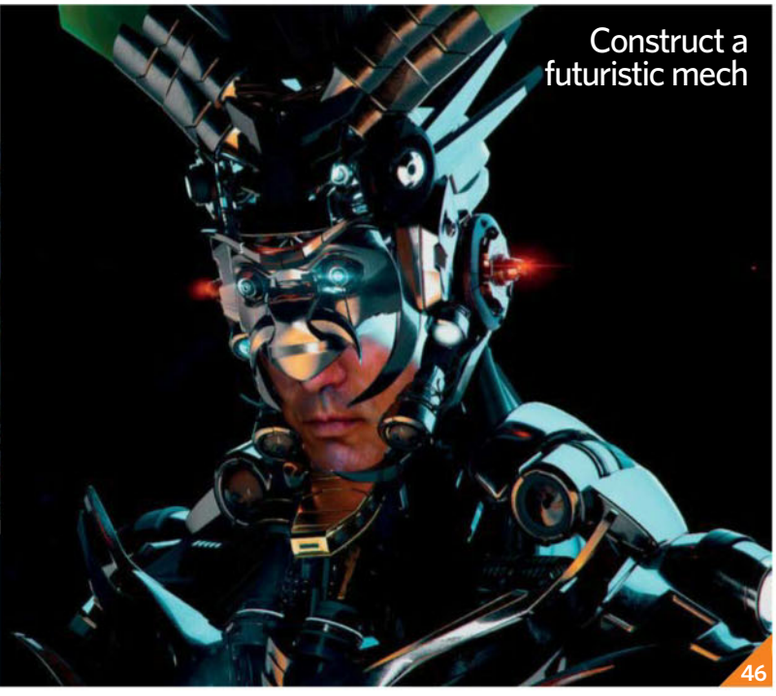

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The Gallery

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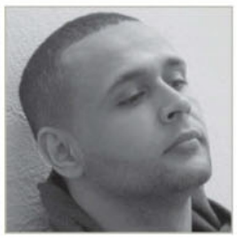
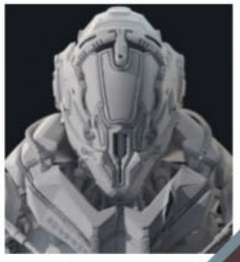


Safouen Laabidi
artstation.com/artist/safwen

Safouen is a self-taught artist, working as a lead 3D modeller for D-TEK STUDIO since 2011

Software ZBrush, 3ds Max, Substance Designer, Substance Painter, Photoshop, After Effects

Work in progress...



"I took most of the robot parts to Substance Designer and baked a curvature map, an AO map and a position map. From that I created a smart material, adding the scratches in a mask and generator combination"

Safouen Laabidi, *Wrecktos robot concept,* 2015

Sergio Filho
tincat.co.uk

Sergio has over 20 years of illustration experience and a Cannes Lions award

Software Maya, mental ray, ZBrush, Photoshop

Work in progress...

"This image was commissioned by JWT agency in São Paulo and is part of a series of ads. The art director was Waldemar França. The other campaign images also depict dramatic scenes of famous plays, like Romeo and Juliet"

Sergio Filho, *Cyrano de Bergerac, the play,* 2015

Jose Klaus González Rohbrandt
joseklaus.cgsociety.org

3DArtistOnline username: joseklaus

Software 3ds Max, V-Ray, RealFlow, ZBrush, Photoshop

Work in progress...

"As a hard surface guy, this scene was a huge challenge as it was mostly made of organic elements. I had to learn how to deal with VRayProxy for the grass, plants and stones, and Particle Flow for the leaves"

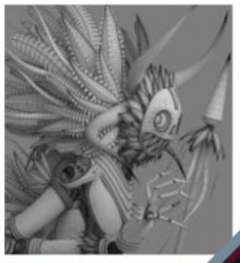
Jose Klaus González Rohbrandt, *BONSAI*, 2015

Fer Aguilera Reyes
pigmachine.cgsociety.org

3DArtistOnline username: pigmachine

Software Maya, ZBrush, Arnold, Photoshop

Work in progress...



"This was inspired by the song *Mambacore*. I wanted to illustrate two aspects: the sounds of the song based on African instruments and rhythms, and the electronic music scene"

Fer Aguilera Reyes, *Mambacore,* 2015

> With this piece I wanted a new workflow for quick robots. The plates were sculpted from DynaMesh spheres and I used different IMM brushes for the mechanical parts

Jörn Zimmermann, *Robot Concept KeyShot Render,* 2015

Jörn Zimmermann
artstation.com/artist/joern

Jörn is a UI Designer currently working at Ubisoft Blue Byte's Mainz Studio

Software ZBrush, KeyShot, Photoshop

Work in progress...

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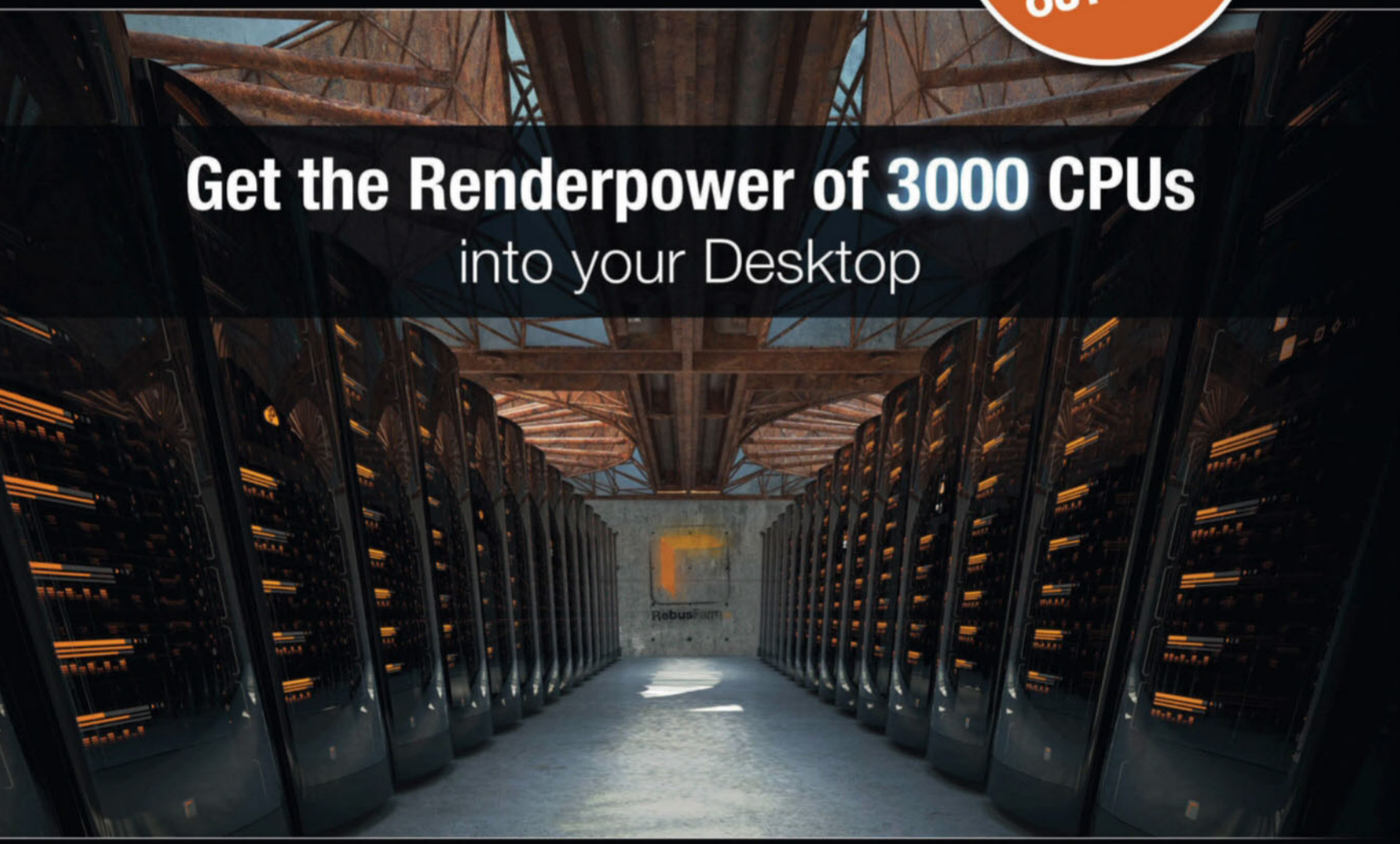

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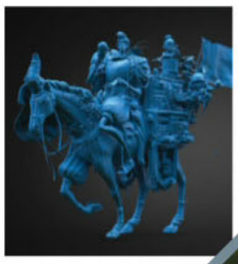
Patrick Evrardt
patrickevrard.com

Patrick is a 3D artist from Belgium with a passion for character design

Software ZBrush, Maya, Photoshop, KeyShot, V-Ray

Work in progress...



"This image was created for the Trojan Horse Was a Unicorn festival challenge. This year's theme was tribes"

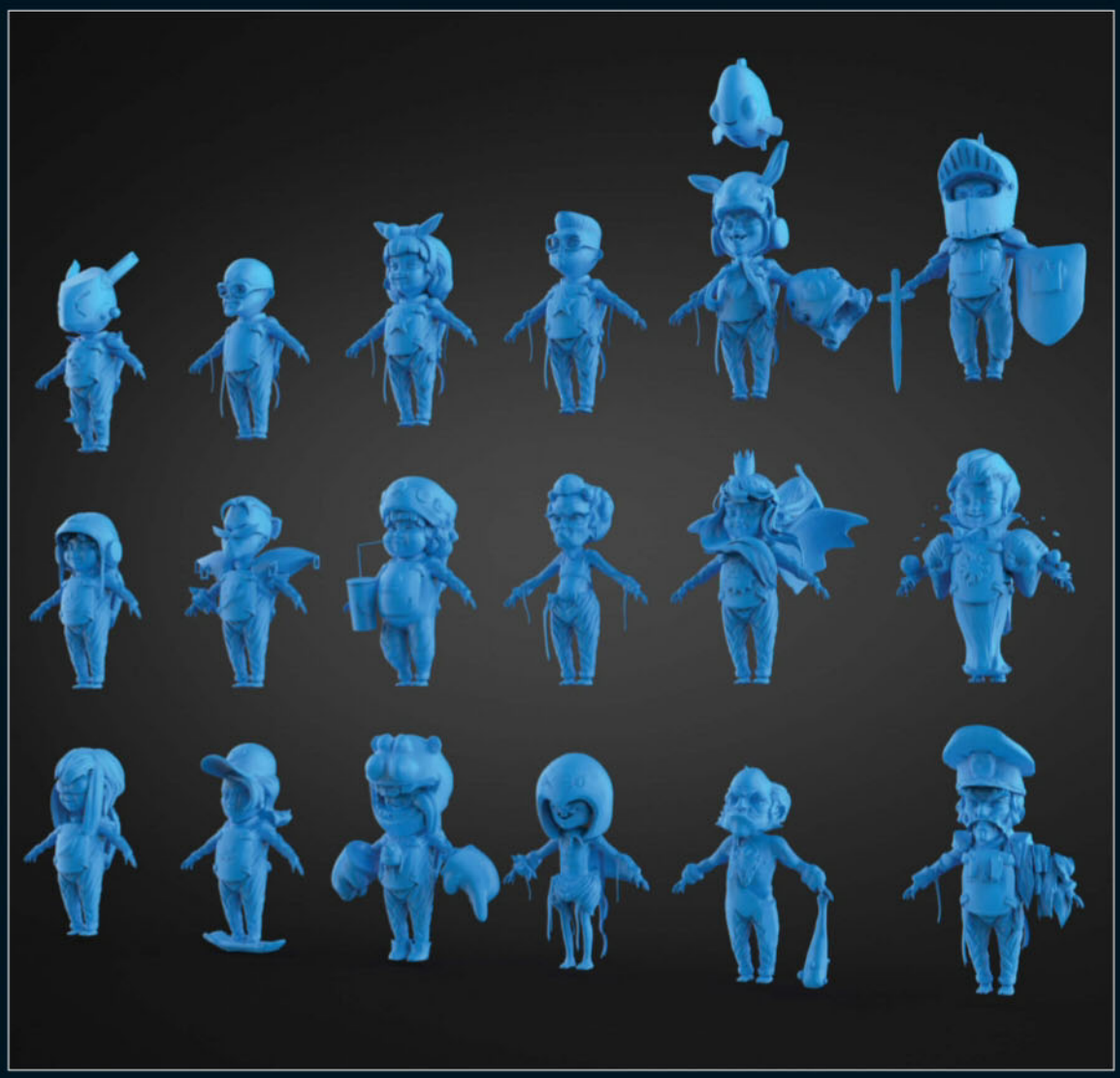
Patrick Evrard, *THU 2015 Challenge Entry,* 2015

> With creating character silhouettes: I'll sculpt until I'm happy with the base form. I might use Polypaint to get inspired, which I can apply with Spot Light
>
> **Patrick Evrard,** *THU 2015 Challenge Entry,* 2015

CREATING ART FOR A COMPETITION
TOP I tried to visualise the challenge itself, with all the different challengers working in their own style and by doing so creating their own kind of tribe. All the time being watched by more anonymous online followers. I think I worked on this image between 170/255 hours and it was a ton of fun.

MY INSPIRATION
TOP When I think of tribes I think of being proud. This was my starting point. I didn't want it to be too serious so I thought I would go for a cartoon-y style. A silly face alone wouldn't do the trick though so I went online looking for inspiration on the THU page (**trojan-unicorn.com**), which I found in a comment of a photo. The photo showed a few speakers at the previous THU event just sitting at a table in the sun. The comment was that they were all masters in different skills and styles. This inspired me because this is what I also like about challenges: people with different skills and styles coming together to join a challenge. This is what I wanted to represent in this picture.

CHARACTER DESIGN
RIGHT I just finished *Breaking Bad* and had seen a lot of likeness studies of Walter so I thought it would be funny to have him cooking on the back of the horse. The two girls on the dragon are based a bit on my daughters, one is Lux (light) and has a glowing crown and fluorescent light. The other is Lotus based on the flower, she has petals of a lotus flower as hair. There is a sci-fi shooter on the back of the horse but I didn't want him too aggressive-looking so I made him shoot soap bubbles in the shapes of hearts.



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THE BLUEPRINT FOR SUCCESS

We go behind the scenes at Wargaming, creator of World Of Warships, and discover a 3D production pipeline like no other

Whether you're making videogames, films, commercials, shorts or otherwise, the process generally starts the same way – with a basic concept. This can take many forms, from full 3D concept work to matte paintings of landscapes and, in a lot of cases, hand-drawn reference materials. At Wargaming, the studio that has achieved monumental success with games like *World Of Tanks* and *World Of Warplanes*, they do things a little differently.

Formed in Minsk, Belarus, in 1998, Wargaming has grown exponentially since the release of worldwide phenomenon *World Of Tanks*, which was first released in 2010. Due to its massive popularity and wide appeal, Wargaming set out to release follow-ups to its flagship IP, and so the company looked to other methods of warfare for inspiration.

A high level of success and user uptake for *World Of Tanks* enabled the studio to move into new locations around the world, and at present it has offices in locations around Europe, America, Asia and more. We were invited to the company's development studio in Saint Petersburg, Russia, to learn all about its unyielding approach to historical accuracy that extends far below the game's polished surface and right down to the modelling and texturing of authentic sea vessels for its latest title, *World Of Warships*.

Wargaming's asset library is impressive, with over 2,000 objects that can be used

You'll notice that a large proportion of the expert tutorials that we commission for 3D Artist start in exactly the same place – gather references. At Wargaming, this is a crucial part of the pipeline and has resulted in the team of artists in St Petersburg pushing the boundaries of historically accurate models in videogames. By utilising a combination of photographic references and, amazingly, original blueprints and schematics from the early to mid-20th Century, the Wargaming team devotes a huge amount of time to research in order to fulfil its fidelity remit, as senior technical artist Alexander Zotikov explains.

"I would say that we are researching when we are modelling. That's why just one modeller creates the model and then [does] the texturing, because the period when they model is also the period when they understand what happens on that [particular] ship. And then they know that, for example, 'this thing is for something' and 'there you need to texture something', like some rust maybe. Because, if I gave you just the 3D model and said 'can you texture it for me?' it will take a lot of time to understand what happened.

"It's a good thing to learn [as much as you can] about the ship or object that you're making. I think the modeller has to learn what they're doing. So before I start modelling, I try to read about the ship and what it has done in the past, historically."

Artists work on individual ships by themselves, taking control of both modelling and texturing to an astonishing level of comparison with the real thing. It's a process that takes many months and one that requires the artist to be completely au fait with their allocated ship, from the overall hull shape right down to the nitty-gritty such as chain placement and ascertaining where you'd find examples of rusting on a real boat. This is best achieved by thoroughly researching the ship.

"On the one hand [research] can help you to create some construction things," continues Zotikov, "like you understand that this ship is not symmetrical and you know that on the right side it will have some curves – sometimes you cannot understand these things from photos or blueprints. On the other hand, it's difficult to model and texture one model for several months – you need to have some stimulus. It should be like it's a part of you!"

Art director Anton Oparin, however, warns us of the dangers of going overboard with photo references, as it can have a detrimental effect on your personal workflow. "You can collect a lot of information and exact references and try to [make] accurate, realistic models. In the case of landscape models we collect a lot of references to make realistic environments.

"A large amount of references *can* [result in] bad work because it doesn't make you concentrate on specific objects. We use the main reference for the hull shape, for example, and smaller references for texture and for parts. Before our artists can start working they combine these references and then they will make the first prototype to make sure that they have made things the right way."

It's a thorough and, to the untrained eye, unforgiving process. Imagine being asked to draw one of these ships 100 per cent accurately, let alone having to model and texture these ships so that neither an eagle-eyed player nor pedantic historian would be able to find fault with your rendering efforts. Luckily for the Wargaming team, its established production pipeline comes complete with its own neat little shortcuts to help lighten the load.

Key to this interesting pipeline is Wargaming's object manager, which is essentially a vast library of different assets that modellers can pillage to speed up their own personal workflow when building a ship for the game, as Zotikov explains. "There are over 2,000 objects such as fire poles and stairwells. We also have planes and all of the different kinds of guns, like anti-aircraft, main guns for battleships and cruisers, secondary guns and torpedo tubes. Much the same, we have [a library of] locations and buildings."

Of these prebuilt items, a proportion of them are country-specific, such as flags and different variations of lifeboats that are specific to the different fighting nations depicted in the game. All of these prebuilt assets give Wargaming's 3D

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There is a 300,000 poly restriction, but the details per ship to make up the poly count differs

artists the scope to spend an awful lot of time getting the fundamentals right, such as hull design, bridge design and scale across the board.

An interesting example that we were shown is the chain tool that Wargaming's 3D artists have at their disposal, allowing them to place multiple instances of the same chain geometry on the particular ship that they're building and then hop into the rig and change the chain's position and style on the fly. Zotikov explains how the scripting process works.

"This is MEL script but most of our tools are now done in Python. It's useful because you can use external libraries, and also for this tool, each chain has its own mapping. We have a Smart Object in Photoshop that you put on your ship and then you just push the button and the chain is magically mapped in other textures, so you don't need to place by hand. So we don't need to have a lot of objects on our ship, so we have one object with one texture for optimisation. Although, sometimes we have two texture sets, especially on a big ship."

These helping hands are a neat augmentation of the development team's core focus on accurate models and texture maps, and they allow the team to cope with such huge demands, both in terms of meeting the brief for individual ships and the fact that the game is set to feature an enormous amount of different playable vehicles, as Zotikov tells us.

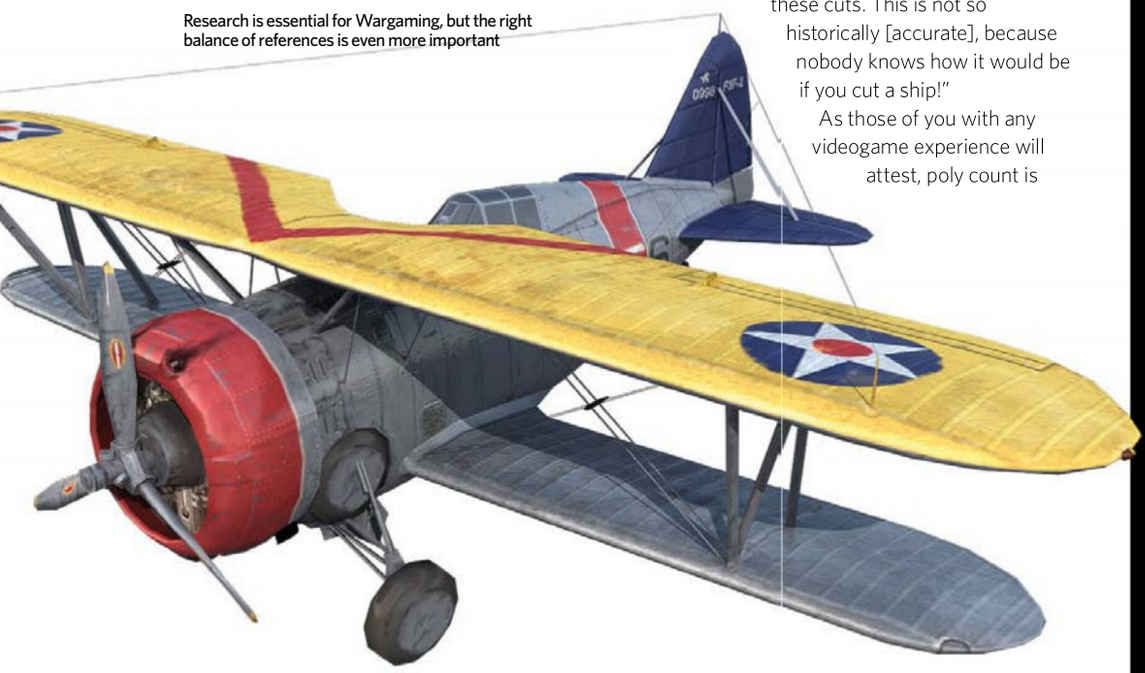
"We have various types of ships. In our game we have destroyers, the largest [of which] is about 100m, we also have cruisers that are about 150m, but they can differ a lot, and sometimes they have aeroplanes. There are light cruisers and heavy cruisers, which are as big as battleships. We have battleships that have big guns and [a lot of] power, and they differ a lot [in size]. Then we have carriers..."

Zotikov goes on to show us a model on his screen that appears to be cracked in several places. He explains that "when you die – the ship can separate into two parts, so we have these cracks that we also have to model. We model three cuts so it can [separate] in different ways. We also have to model the internals, and that's why we need blueprints to make sure that [a ship] had [for example] four or five decks.

"We cut the outer shell by hand and inside it's all a reference model. We have these decks as reference so we can put them inside your ship. We also have some references for these cuts. This is not so historically [accurate], because nobody knows how it would be if you cut a ship!"

As those of you with any videogame experience will attest, poly count is

Research is essential for Wargaming, but the right balance of references is even more important



War machine

Wargaming has finely honed its craft with two games prior to World Of Warships, both of which set their sights on fidelity

World Of Tanks

First released in 2010, *World Of Tanks* helped to popularise the sometimes-derided free-to-play market with its undeniably addictive brand of team-based warfare. Sat in a tank of your choice, you and your comrades would do battle with another team across vast and varied environments. It was here that Wargaming began to fully harness its talent for historical re-creation, and even five years ago the vehicle models were second to none in terms of their authenticity, with only games such as *Company Of Heroes* really competing with Wargaming's understanding of modern military history.

World Of Warplanes

Wargaming took to the skies in 2013 with this follow-up to *World Of Tanks*, offering you the opportunity to compete in over 100 different aircraft models, again all built to a dizzying level of authenticity. The aim of the game was, once again, team deathmatch, but this time the focus was on gaining air superiority by downing enemy fighters and multirole aircraft. The quality of modelling and texturing is plain to see as in *World Of Tanks* – even the most minute of details are included, and the environments that you dive and roll over are as expansive as they are stunning.

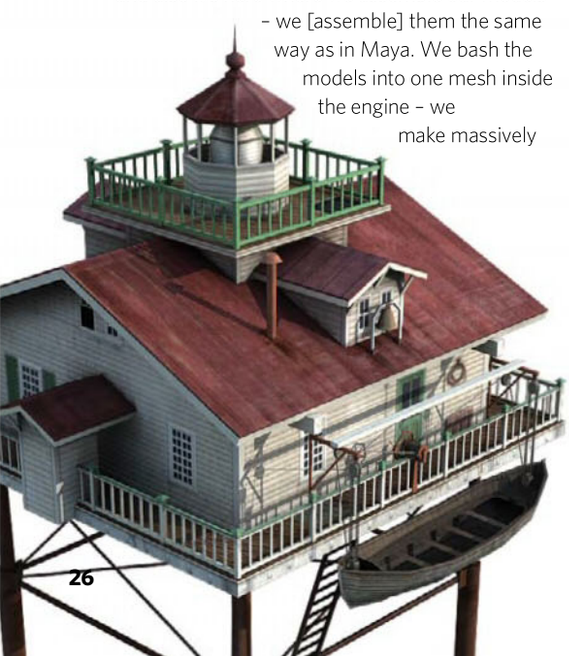
Each ship is modelled and textured by a single artist, who will learn everything they can about their ship

often a concern when building models before placing them in-engine. Zotikov is in agreement that it can be a concern, but makes it clear that the team needs to be adaptable in order to be able to deal with the different demands that each individual ship model presents.

"We have a 300,000-poly restriction," he reveals, "but it always differs [depending on] time modelling. It can be a little ship but with a lot of details that we need in the game, so we need to model all of them. But sometimes we have a big ship with not a lot of details, so it really differs."

Once the model is finally finished, the team foregoes churning out a render to check its quality, instead opting to export the model and, separately, its texture maps, from Maya and into the BigWorld MMO game engine, where it is all pieced together. This process enables the artists to see their models with proper illumination as a preview in the game engine, and ensures that they're able to spot any problems before submitting the final product.

"We have statistics on textures and polygons and also it's here where we assemble our models – we [assemble] them the same way as in Maya. We bash the models into one mesh inside the engine – we make massively multiplayer online games so they need to run fast! Optimisation is key. We have a lot of ships and they should be similar to each other – one shouldn't be more polygonal than another."



Zotikov agrees with us when we ask whether it's a bit of a shame having to slightly reduce poly count and, subsequently, visual quality in order to ensure that everything is of a comparable level and can be used in-engine, however, in game development this is essential. What was overtly clear to us was the amount of technical skill, passion for history and artistic flair that goes into each and every model that Wargaming makes in Saint Petersburg, and despite the need for historical accuracy, the artists still approach the modelling and texturing processes as art. "But sometimes," reveals Zotikov, "you have a lot of photos and a lot of blueprints, and you can't just put something where you want! There are two sides to it."

Judging by the success of its forebears, it looks likely that *World Of Warships* will be immensely popular when it launches in the near future. Despite spending a long time in development, Zotikov and his team are far from finished yet. "Now we are really focused on our game and we have some time for revisions. Our department needs to export *a lot* of ships!"

***World Of Warships* is currently being developed by Wargaming. For more information please visit wargaming.net.**

Tools of the trade

Art director Anton Oparin explains Wargaming's artistic pipeline and primary 3D toolset

How is the artistic pipeline different starting a new game compared to when you made *World Of Tanks*?

I guess our pipeline is quite different now. We started with a pipeline [that was] almost exactly like *World Of Tanks* but after some time we refined it for our needs. We refined all the models, the shaders, editors and some tools and now we have a different pipeline with different technologies. Of course we use the same basic technologies because we are using the same engine but [individual] parts are quite different.

Has the same software always been used throughout?

Maya is our main 3D program. For some tasks we use 3ds Max and Houdini for special tasks, but the main one [that we use] is still Maya.

Is there any reason that Maya is the main program used?

Maybe because most artists are more familiar with it and Maya is good for game development. Of course Max is the same but we've chosen Maya!

Will Autodesk going subscription-only change a lot for you?

I guess we will use the subscription licence – we [already] use some subscription licences for some technical tasks The use of subscription licences isn't a problem.

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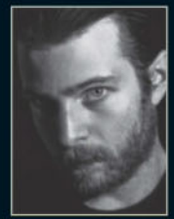
Technique focus

Incredible 3D artists take us behind their artwork

SCULPTING To sculpt the dragon I mostly used the default brushes. I could have obtained a much more realistic effect with custom Alphas but I was going for a 'clay sculpting' result. The most useful tool was referencing. Taking the time to study sculptures or illustrations and analysing shapes and proportions were very interesting and a time saver.



Gabriele Maiocco
gabrielemaiocco.com
3DArtistOnline username
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Software ZBrush, Maya, Marvelous Designer, KeyShot

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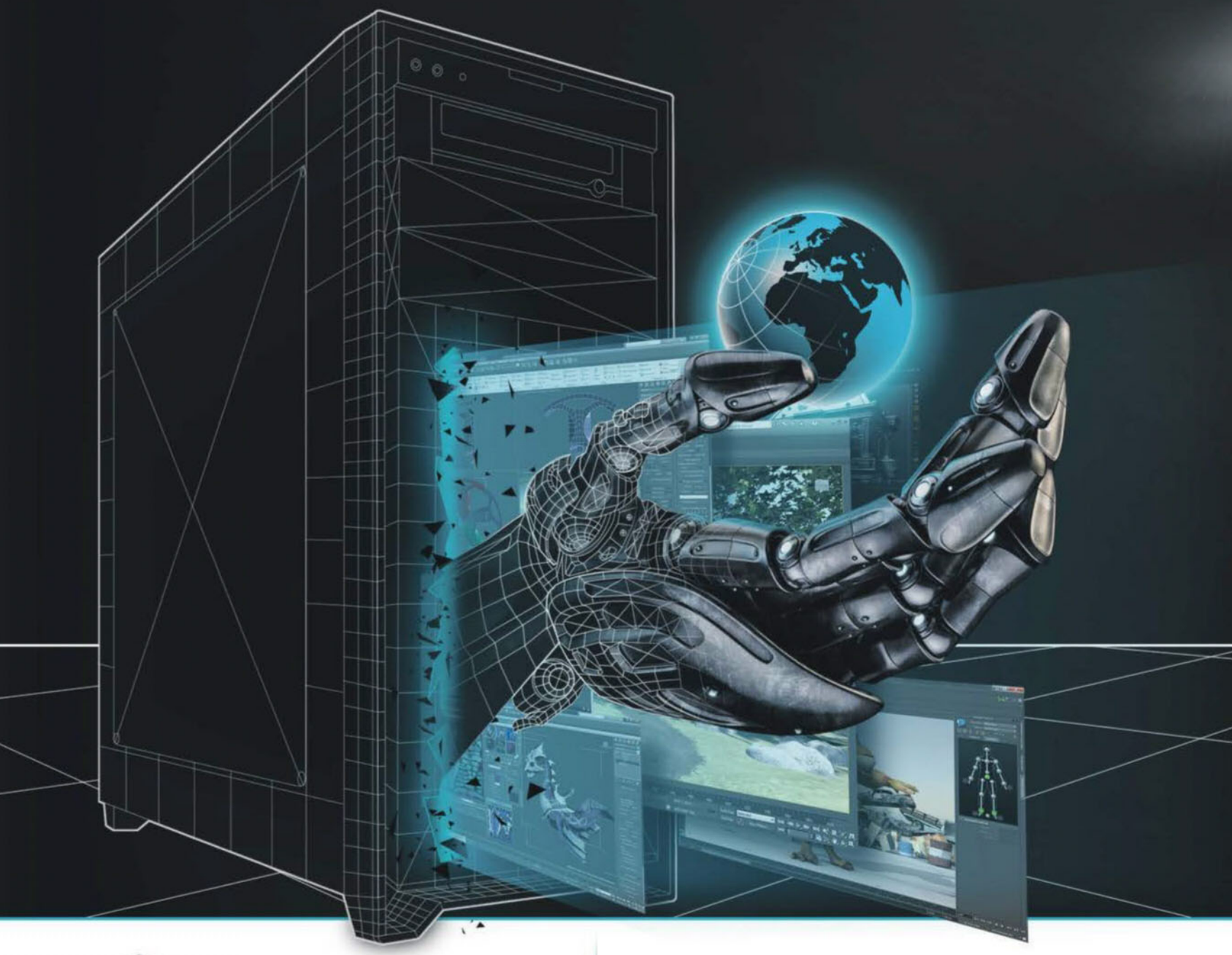

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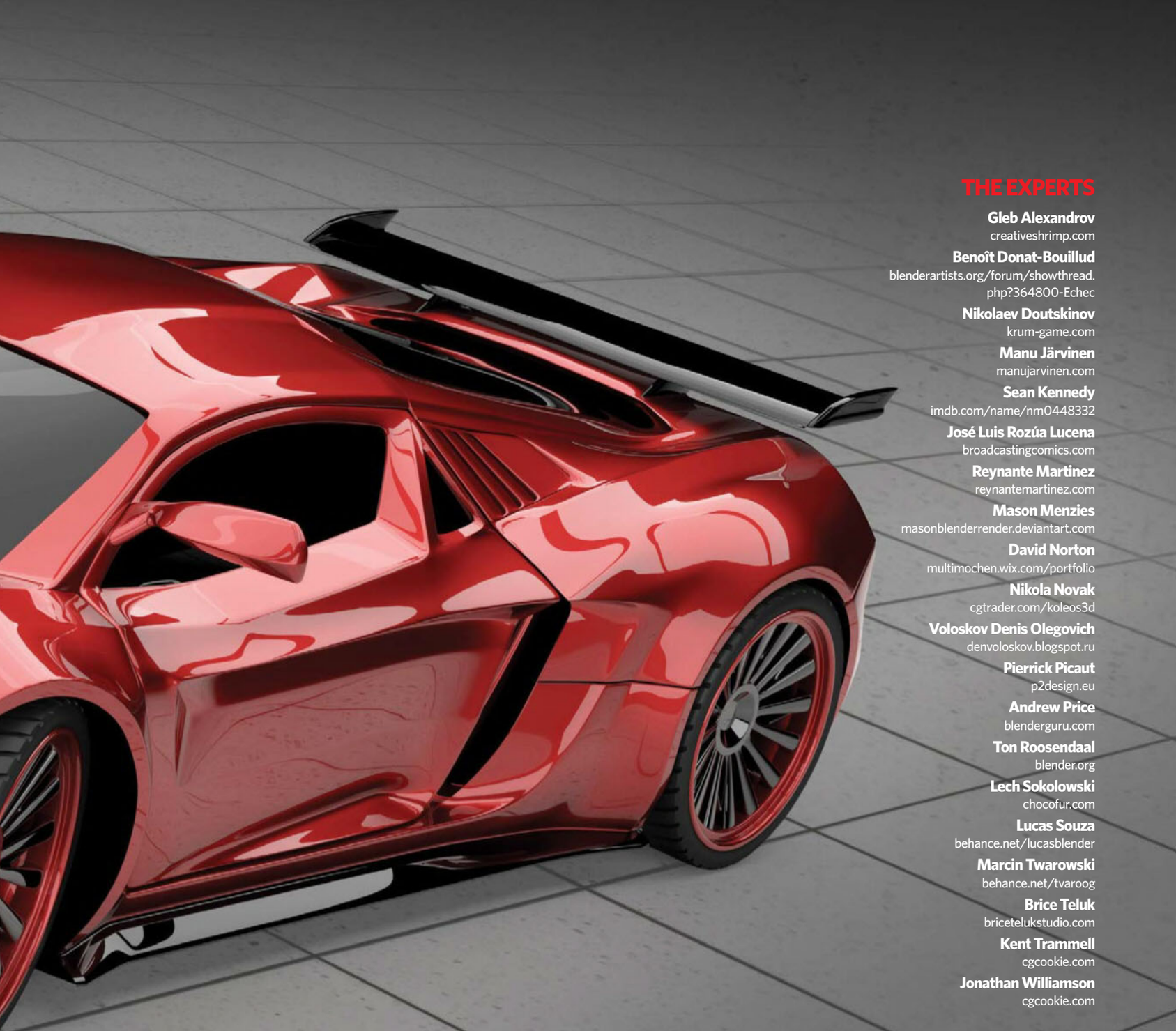


THE EXPERTS

Gleb Alexandrov
creativeshrimp.com

Benoît Donat-Bouillud
blenderartists.org/forum/showthread.php?364800-Echec

Nikolaev Doutskinov
krum-game.com

Manu Järvinen
manujarvinen.com

Sean Kennedy
imdb.com/name/nm0448332

José Luis Rozúa Lucena
broadcastingcomics.com

Reynante Martinez
reynantemartinez.com

Mason Menzies
masonblenderrender.deviantart.com

David Norton
multimochen.wix.com/portfolio

Nikola Novak
cgtrader.com/koleos3d

Voloskov Denis Olegovich
denvoloskov.blogspot.ru

Pierrick Picaut
p2design.eu

Andrew Price
blenderguru.com

Ton Roosendaal
blender.org

Lech Sokolowski
chocofur.com

Lucas Souza
behance.net/lucasblender

Marcin Twarowski
behance.net/tvaroog

Brice Teluk
bricetelukstudio.com

Kent Trammell
cgcookie.com

Jonathan Williamson
cgcookie.com

When faced with an all-in-one 3D software solution that's also completely free to run, it's only natural to think that there must be some kind of catch. After all, the idea does sound too good to be true – and the common belief is that you get what you pay for. Assuming that because Blender is free it must not be a truly professional tool, however, is probably one of the greatest misconceptions in the industry.

"To be completely honest, the main draw for me was that it didn't need to be installed. You just download it, unzip it and run it," begins visual effects artist Sean Kennedy, who first began using Blender throughout his time at Rhythm & Hues. "Sometimes for my shots, I would want small elements to composite in, like dust hits or background birds. At a large facility like R&H, this was a huge process. Everything would have to go through modelling, rigging, animation, texturing, get approved by at least two or three supervisors, and then finally get sent to me a week after I requested it. Blender intrigued me because I could download it and just have a program on my desktop that would let me make all these little elements."

Kennedy was a lead compositor and would regularly create elements in Blender for the entire team. He even taught Blender to co-workers in after-hours classes. "People on movies I wasn't even working on would ask me for the background bird filesets I had created. Some of the movies I used Blender on were *Big Miracle*, *RIPD*, *Percy Jackson: Sea Of Monsters*, and one very small contribution to *Life Of Pi*... Features like Dynamic Paint really made jaws drop!"

Still actively developed by hundreds of artists, animators, VFX experts and hobbyists all around the world, Blender has changed the lives of more and more teams. Built-in features like a full compositor, video editor, 3D sculpting and animation tools along with a constant stream of new free add-ons have enabled artists access to what would otherwise be completely unattainable on a tight budget. The results have been incredible.

With open projects like 'Tears Of Steel', 'Sintel' and now *Agent 327* and *Cosmos Laundromat*, Blender has proved that even full films can be created. More production-quality Cycles renders are being shown off every day too. We spoke to some of the best Blender artists in the industry to discover more about just how much this surprising piece of software can do.

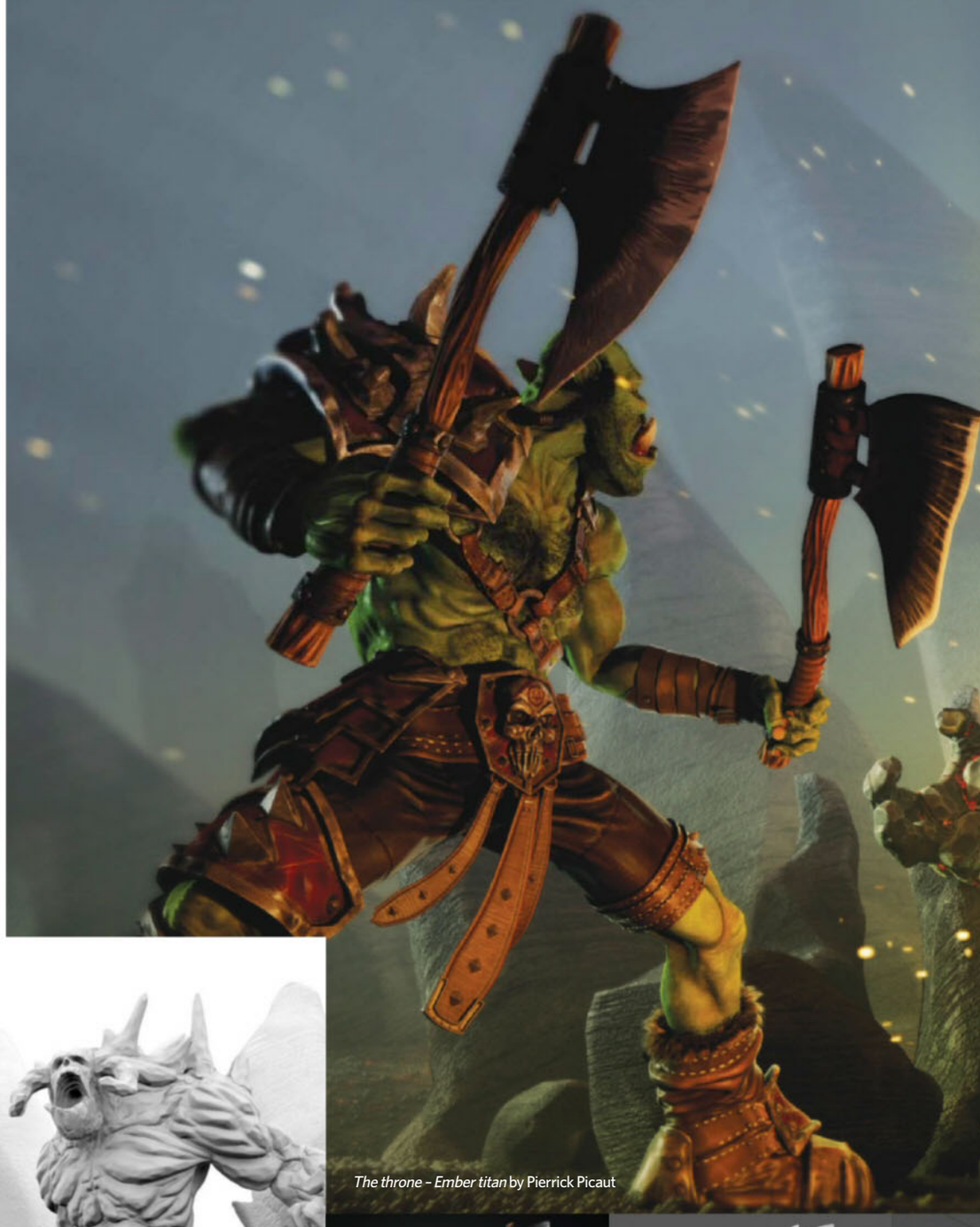
01 Sculpt a monster

Dynto sculpting *with Pierrick Picaut*

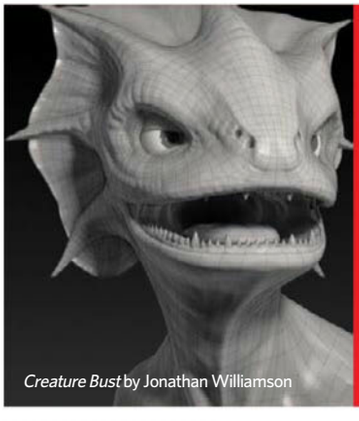
With a host of modelling, sculpting, UV unwrapping and retopology tools, and with further innovations in mesh editing being developed for 2015, Blender is now not only being frequently used for hard surfaces, but for creating organic meshes as well.

"Blender sculpting tools turned out to be a must-have for my work since it has dynto sculpting," reveals Pierrick Picaut, who is a Blender Foundation certified trainer.

Dynto sculpting, or Dynamic Topology Sculpting, is a sculpting mode where brushes used will subdivide a mesh as needed during the stroke, enabling artists to create complex shapes out of the simplest initial base. "So even if Blender can't handle as many vertices as ZBrush, it generates geometry on the go and the brushes just react so well," Picaut continues. "That's one of my favourite tools." Another invaluable asset, he explains, was the help of the Blender community.



The throne – Ember titan by Pierrick Picaut



Creature Bust by Jonathan Williamson

Make mesh modelling more like sculpting *by Jonathan Williamson*

"The most exciting part of Blender's modelling toolset, in my opinion, is one of its oldest features. This is the Select>Edit modelling workflow as opposed to the more common Tool>Select>Edit workflow. In essence this means that Blender lets you work very quickly based on quick hotkey actions (such as extruding a selection at anytime by simply pressing E) rather than requiring you to first specify a tool and then perform the action.

"The real benefit to this is speed, as you can instantly activate different tools and operations with a single click or hotkey. This workflow makes mesh modelling behave more like sculpting, in terms of raw speed and efficiency."

Shaping the human head and face
with Kent Trammell

01 As an organic shape, the head and face of a character are excellent candidates for when you're using dynamic topology sculpting.

02 Because of this, I'd start with a simple sphere and rough out the main structures, moving with the Grab brush and pulling out new geometry – like the neck – with Snake Hook. Then it's just polishing eyes, nose, mouth and ears.

03 For a female with long hair, I would create a base with the Skin Modifier, which is similar to ZBrush's ZSpheres. It allows me to quickly generate and shape new geometry that can easily be styled into a hair base. From there it's polishing the hairstyle with brushes like Flatten and Crease to approximate a strand structure.

SSS Study by Kent Trammell

The Lamp by Gleb Alexandrov

02 Render stunning lighting Q&A *with Gleb Alexandrov*

Gleb Alexandrov is already famous for the quality of his Blender work and tutorials on **creativeshrimp.com**, but his passion for the importance of lighting inspired him to go even further. With his Open Lighting Project, Alexandrov has been publishing chapters for a Blender/Cycles-based book of tutorials, developed specifically for anyone who has ever struggled with lighting.

How did you first come up with the idea for the Open Lighting Project?
The idea behind my Open Lighting Project is simple. Lighting is much more than just the angle, the softness and the position of the lights. But what about the mood? And most importantly, what about aesthetics of lighting?

For example, lighting a highway at night is not simply a bunch of omnilights. If you really start looking, you will discover the weird world of blazing trails, infinite motion and fireflies swarming. All of that makes your night-time highway lighting a complex aesthetical phenomenon, and it should be analysed as such.

What are the most important things you've learned from your work?
1. Think about the mood and emotion first, technique second. Your viewer will see the overall mood and emotion of your work first, so pay attention to it.
2. Don't use lighting just to showcase your finely crafted model. Lighting is a massive creative force by itself. If you use it only to showcase your model, you will miss the point.
3. Don't lock yourself in a box. Use knowledge from other fields, such as photography and film. Grab a camera and try creating overexposed high key lighting (you will love it!).

Exploring beyond three-point lighting
by Reynante Martinez

"Lighting plays such a huge role in my work that I often tend to include it in the preproduction stages of my workflow. Before getting into the nitty-gritty of the modelling and texturing phases, I try to get an overall sense of depth and emotion in my scene by creating lights and shadows.

"To start off, I would usually utilise Blender's image-based lighting tools and use an HDR image as my primary light source, which will also dictate the time of the day that my scene is set in. If this works, I add complementary lamps (point lights, mesh lights and so on) to further accentuate the form of my objects; otherwise, I would use a Sun lamp to create my primary light. I usually don't stick with the three-point lighting method as is usually suggested, instead I add as few lights as possible or as many as needed, instead of constraining myself to a set of rules."

03 Create unique character art

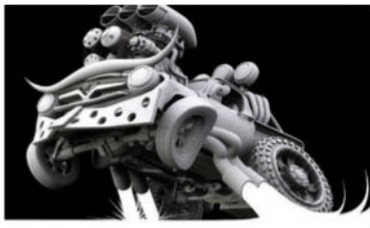
Concept work *with Manu Järvinen*

Now six years since he first started learning Blender, animator, modeller and illustrator Manu Järvinen has completely switched to open source software to create his unique personal character work. His favourite applications include Blender, Krita and GIMP in Linux.

"I like to model almost every single detail of an object by hand," says Järvinen, "so, it basically is just meticulous and hard work. I also like to make a lot of test renders in order to see where the picture is going and to make sure the earlier decisions of removing or adding something to the image were wise choices. Often they were not."

"Essentially, I don't like boring objects. So, I like to caricaturise or add at least some kind of personality, imperfections or wonkiness to pretty much everything I make."

Fishy Cat by Manu Järvinen



Like a bull by Manu Järvinen

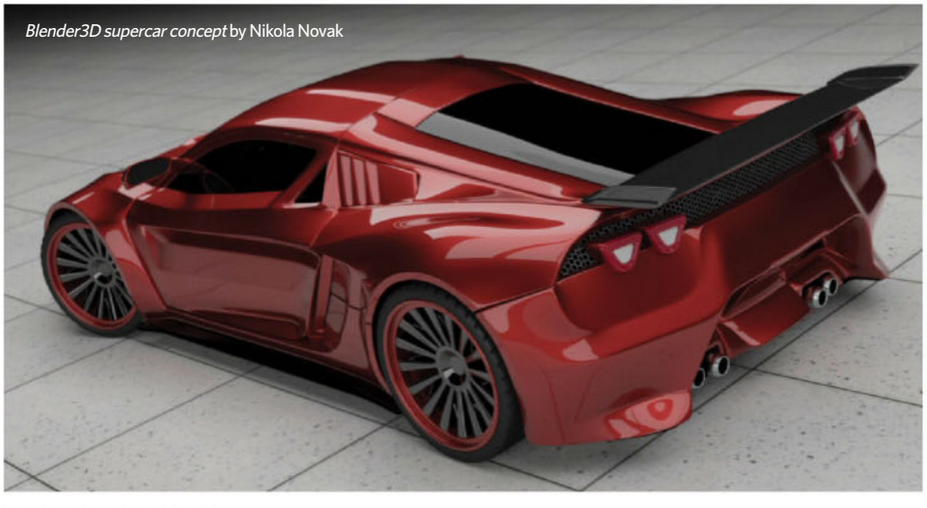
04 Model a futuristic supercar

Essential techniques *with Nikola Novak*

Innovations in mesh editing keep happening in many ways in the CG industry, and for Blender this has been no different. Campbell Barton – the lead coder of the Mesh module on the Blender development team – is officially planning to reserve many months next year to work on mesh tools to improve them even further.

For cover artist Nikola Novak, hard-surface modelling techniques and mesh tools were crucial in creating his latest futuristic supercar concept in Blender. "For most of the car's body design and 3D modelling I needed just one day," Novak begins. "I was very pleased with the design from rear and side view. The biggest problem in design was with the front view of the vehicle, which I spent about five extra days changing and editing until I was pleased with the final look."

"I've found edge-by-edge modelling techniques fit best, so I modelled with a circle mesh shape. Then I extruded the edges of the circle to cover the edge of my image references," he continues. "When I was pleased with the design I added a Subsurface Modifier to my model to subdivide it. This makes the model look blobby, but after adding loops with Cmd/Ctrl+R, I created sharper edges, and it looked just as I wanted. I also made changes by editing vertices, edges and polygons on the hood and front windows to get the right design proportions."



Blender3D supercar concept by Nikola Novak

05 3D print like a pro

Solid prints *with Kent Trammell*

It's an amazing feeling to be able to create something in a computer and only hours later, be able to hold it in your hands – so it's no surprise that 3D printing has become so popular amongst 3D artists today. What is surprising is that Blender also has the ability to easily prepare any models for 3D printing – including error checking the mesh for few overhangs, manifold geometry, correct thickness and no intersecting faces – before exporting them ready to print.

"From the beginning my intention was to print so I modelled with things like thickness and construction in mind," tells CGCookie's Kent Trammell. "Blender comes packed with a very helpful add-on called '3D Printing Toolbox' that helps to get technical details correct for printing. I tested the centre of gravity by running a rigid-body simulation with Blender. Surprisingly it stood up by itself well and was later confirmed to do so as a physical print. Jonathan Williamson was kind enough to print for me with his Form 1+ and the final quality blew me away. My new dream is to model and print custom toys for my baby boy when he grows up."

Alien2 by Sean Kennedy

06 Composite a VFX scene

Rotoscoping *with Sean Kennedy*

From colour grading, lens distortions, vignettes and film emulation, to rotoscoping and tracking, many don't realise that Blender's built-in compositor can do it all and more.

For VFX veteran Sean Kennedy, in fact, Blender is now his favourite program to roto in. "I had been learning Blender around the time they were creating the tracking and rotoscoping toolsets for use on the Blender Foundation's 'Tears of Steel', so I was experimenting with the tools while they were implementing them," he explains." They did a really good job with tracking and rotoscoping. The tracking is unbelievable. It's the fastest tracker I've ever used. And the planar tracking is extremely straightforward and easy to use. In regards to rotoscoping, it's also very fast and simple especially once you know the hotkeys."

"Another thing I really like about it is that every node's properties are right there on the node itself," Kennedy continues. "You don't have to have a properties panel open to adjust settings. It really is every bit as powerful as any other compositor."

The single greatest advantage Blender gives for Kennedy, however, is not within the software itself, but with the people who develop it. "I experienced this first hand at the Blender Conference a couple years ago," he remembers. "I was chatting with Sergey Sharybin, the lead developer of the rotoscoping toolset. At this point they hadn't yet included Bezier handles as a handle type, and were thinking of not doing it. In about five minutes I talked them into it, and ten minutes after that Sergey had a working demo. In my entire career, I'd never seen such a quick implementation of anything!"

07 Simulate destruction

by Andrew Price

"When you first approach simulations, it's both fun and intimidating. Simulations have been referred to as the 'dark arts of CG' for their frequently unpredictable behaviour and time-consuming tweaks.

"Thankfully though, when you're starting out you're in good hands. Blender has a reputation for its many tutorials, so whether you want to make fire, water or just complete destruction; you'll find plenty of help.

"Smoke is probably the most fun and easiest simulation to pick up, so I'd recommend starting there. You can create a smoke simulation in Blender in just ten seconds: Open Blender, press Spacebar, type 'Quick Smoke', press Enter and then Opt/Alt+A to run it. The default cube is now on fire!

"Like most young males, I've always been drawn to destruction and the chaos of the real world. My first short film ('The Ballad of the M4 Carbine') was a pretty shameless excuse to feature a bunch of automatic rifles firing. And in the six years since I created that, I've created explosions, flame-throwers, water splashes, sparks and a wrecking ball for equally pointless reasons. I just love destroying things, and Blender is my big open sandbox."

Shattering glass with a bullet in Blender

"The plane of glass was first broken into smaller pieces using the Cell Fracture add-on (File>User Preferences>Addons), and then simulated using the rigid body simulator to make them come to life, reacting to gravity and the impact of a heavy bullet shooting through them. For more realism I then made each glass piece emit a further 100 tiny shards of glass using the particle simulator. And then for the final touch, I used the smoke simulator to create that ultrafine glass dust.

"All of this was done inside Blender. You can watch the full tutorial on how to do it here: **bit.ly/BlenderGlassSmash**."

Glass Smash – Fracture, Rigid Body by Andrew Price

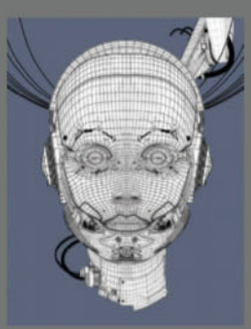
Android by David Norton

08 Texture sci-fi designs

Maps and materials *with David Norton*

"I remember the first time I watched 'Tears of Steel'. I just couldn't believe such an amazing piece of work could be made using an open source program," begins self-taught 3D artist, David Norton. "Android was the first piece of work I shared with that community, and I was very happy to receive a lot of good feedback about it."

Initially inspired by watching *I, Robot*, Android was made almost exclusively in Blender. "I initially sculpted a simple female head using Blender's sculpt tools and the dynamic topology feature. Then I manually retopologised the mesh into quads, keeping in mind that I would want to cleanly separate it into parts at a later stage," explains Norton. "I UV unwrapped the mesh and exported the layout into Photoshop where I painted a simple face texture. After the modelling was complete, I used Cycles to build the materials. A lot of the shading was done using dirt maps, combined with a grunge texture to achieve a 'slightly aged metal' look. Once the image had rendered I used Blender's internal compositor to add some simple glare/glow and contrast effects. After, I took the image back into Photoshop for some quick colour correction."



09 Build stunning arch-vis

Want to develop excellent architectural visualisation scenes without spending money? These artists reveal how it's done

The challenge I ran into with 'Lounge Room' was with the exterior and interior – my computer simply couldn't handle it. I used a fantastic Blender feature called Render Layers to separate the scene into multiple parts and combine them after. *Mason Menzies*

Always observe! Take a lot of reference images, and look at them closely! To get realism, try to reproduce what you see. Also, don't forget that every building, every room, has its own story, and you should put some life between those walls. *Brice Teluk*

Sometimes all you need to create a beautiful illumination is to use an HDRI image as a method of environment lighting. Works great, especially for the exteriors. *Lech Sokolowski*

Use Sun lamp and Area lamps! With Sun lamp you can quickly improve the general illumination appearance in your picture for a beautiful, directional ambient light. Also try to put an Area lamp into every window opening when illuminating an interior. It will speed up the noise-cleaning process and increase the shadow quality. *Lech Sokolowski*

Lounge Room by Mason Menzies

avxhome.se

Handmade deco lights by Voloskov Olegovich

Strawberry dessert by Voloskov Olegovich

10 Render extreme photorealism

Thanks to artists like Voloskov Olegovich and José Lucena, we now know the boundaries of CG photorealism can also be pushed as Cycles gets more advanced

Top tips for Blender realism *by Voloskov Olegovich*

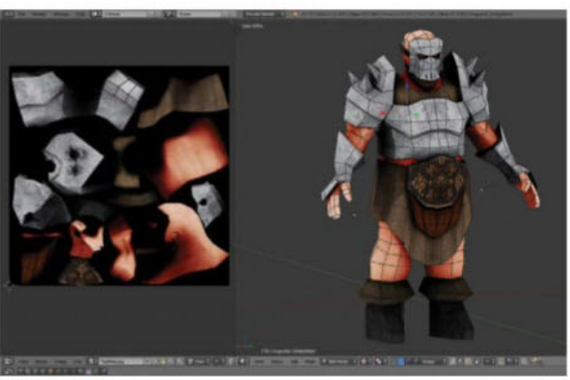
01 Attention to nature, to all the things around you, and an understanding of how to represent those nuances is crucial.

02 A digital camera is a good friend to any CG artist. Learning to use one will enable you to better understand composition, colour and lighting, plus you can shoot your own textures!

03 It's very important to understand how different nodes interact with each other in Blender. Discover what a Fresnel is, and what real materials consist of.

04 Interactive preview is also an extremely useful Blender feature. You can see how your render will look like right in the viewport to be able to quickly check it for mistakes before going for the final image. It saves a lot of time.

05 Remember that Blender's all-in-one interface gives you an extremely wide range of possibilities: you can model, sculpt your scene, paint textures, simulate elements like water, fire and smoke, and much more – and that's all in only one piece of software. Use this to your advantage.



KRUM by Orlin Doutskinov

11 Make a game

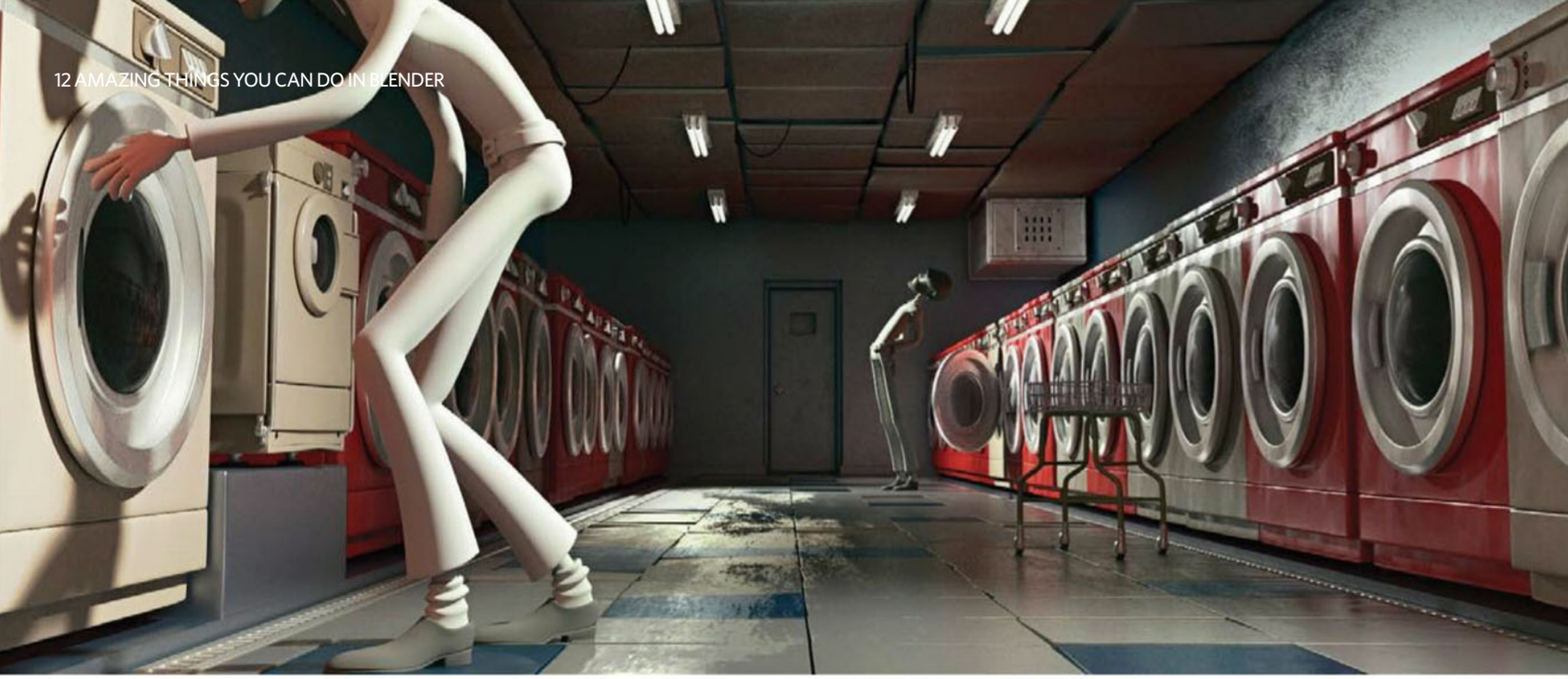
Blender Game Engine *with Orlin Doutskinov*

Incredibly, included within Blender is also a complete game engine, making it possible for anyone to create a fully featured 3D game with their characters and environments.

"I'm a heavy Unity user in my day job," begins game developer Orlin Doutskinov, who has been working in the games industry for over eight years. Using the Blender Game Engine, he recently began to invest any free time he had from working on triple-A titles into developing his very own indie title, *KRUM*: a big third-person fantasy hack-and-slash game.

"One thing that really stands out is the ability to craft or edit your models, textures or write code directly into Blender's environment. No need to switch software for every particular job and cause your PC to crash," Doutskinov explains. "That is why the Blender Game Engine is a hidden gem for small teams or individual game developers, because everything you need for your project is right there."

Just last year, all of Doutskinov's hard work was rewarded when *KRUM* was officially greenlit on Steam. "Honestly, I cried tears of joy! [Getting greenlit is a] dream come true to many indie game developers all over the world," he tells. "*KRUM* is still in development, and I'll continue to develop it in Blender until it is fully done. If I decide to make another game, Blender will still be the first choice."



12 Animate a feature film

Interview *with Ton Roosendaal*

Blender will soon see two film releases to add to its portfolio. The first, code-named Project Gooseberry, is 'Cosmos Laundromat' an animated short with a tentative pilot premier in August 2015. The project supports Blender Cloud: the ability to see every file the professionals made and share them for a subscription fee.

Agent 327 on the other hand is a commercial feature film made by Blender Foundation in conjunction with Martin Lodewijk and Fu Works.

Ton Roosendaal, producer of 'Cosmos Laundromat' and chairman of the Blender Foundation reveals all about the two releases.

Can you tell us what you feel have been the main challenges and successes from the pilot so far?
We still want to wait and see how the audience responds, and what the reception is by important market players. We will make a bold statement with 'Cosmos Laundromat'! It's currently impossible to predict what will happen with that.

At the beginning of the project it was said that 70-80 people were expected to work for 18 months on Project Gooseberry. Has this changed?
My current preference is to keep the scale small, and add parts by involving other small studios one at a time. It also depends on how well we can roll out Blender Cloud. More subscribers means we can do things bigger and stay independent of market players.

Is it true that there was no compositing involved in the making of the trailer? How was this achieved?
Yes we can avoid compositing by rendering the whole scene in one pass with depth of field and motion blur in ray tracing. Obviously that comes at a price – the average render time (on a decent i7 system) runs into six hours now.

Where did the idea of working on a film for theatrical release like *Agent 327* come from?
Making a feature film stays the dream of any animator or film-maker. With the 'Cosmos Laundromat' project on the rails, I want to keep moving on with our creative team to produce more work. We will do some shorts, but having another feature film project to work on is inspiring, especially because we want do it as a 'normal' commercial venture this time.

How will The Blender Foundation be involved with the project alongside Fu Works?
In this partnership we are the film studio, and Fu Works the production company who handles funding and distribution. Obviously we will stick to using open source and Blender – I expect we can even get better funding for that reason.

> We can avoid compositing by rendering the whole scene in one pass
>
> **Ton Roosendaal,** chairman of The Blender Foundation

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REYNANTE M MARTINEZ
Empty, 2015

Software
Blender, Cycles

Learn how to
- Block out the scene and its overall composition
- Create believable shaders using Cycles nodes
- Develop a harmonious and minimal lighting scheme
- Add dust effects using image-textured planes
- Apply postprocessing effects using Compositing nodes

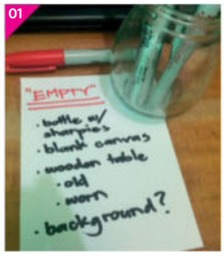
Concept
This piece, Empty, is a visual portrayal of one of the most difficult stages that artists and creators go through. And having gone through this a lot, I wanted to share the emotion that goes with it.

YOUR FREE DOWNLOADS from **filesilo.co.uk/3dartist**
- Scene files
- Video tutorial
- Tutorial screenshots

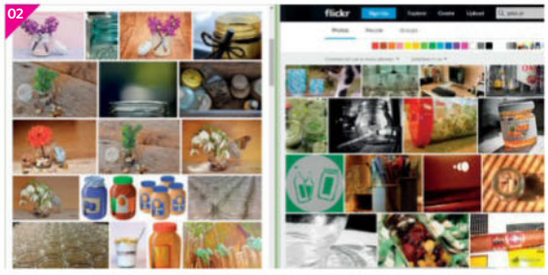
Render still life with Blender and Cycles

Create a visually compelling story using realistic textures and image-based lighting, all with simplicity in mind

This tutorial will guide you through the entire creation of artwork using Blender, starting from the blocking all the way through to the postprocessing phase. We will be guiding you through the creative process that is involved in creating a thought-provoking piece of artwork, while keeping the technical elements as simple as possible. The scene itself is rudimentary, however some of the shaders and textures are a tad more complex than they seem, and we will be guiding you through the entire material creation including some shader tweaks and scene optimisations for achieving fast and noise-free renders using the Cycles rendering engine. You'll also see how dust effects can be added using Alpha-masked hand-drawn textures and some modifier tricks that will add more realism to your models.

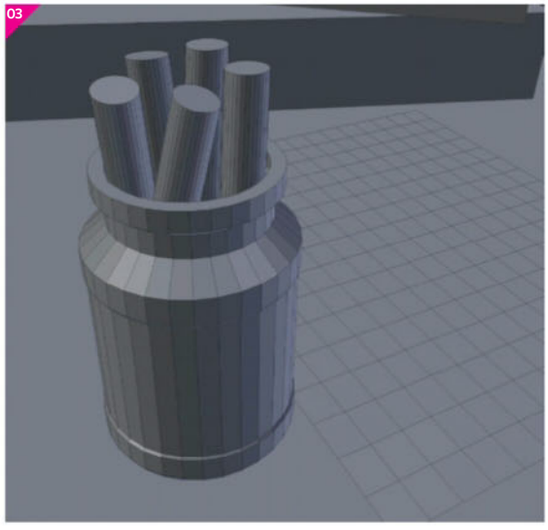


01 Plan ahead Before diving in on a project, make sure that the concept and story is as solid as it can get. There are usually two ways to do this: sketch the concept on paper and/or write a note about the details and idea of the concept – this ensures that you have laid down the initial foundation and will give you a broad sense of what you're about to create. For this project, we experimented with not having a sketch to start with, but rather having a few notes to make the idea more concrete and feasible. It also helped to have an actual tangible reference – luckily, we had one on our desk. If you can come up with a title to work on as early as possible, the better, and most of the elements you'll be adding later will revolve around this title. Don't hold back in the planning stage, the better you've planned ahead, the smoother your project creation will be – too much planning can ruin it too.



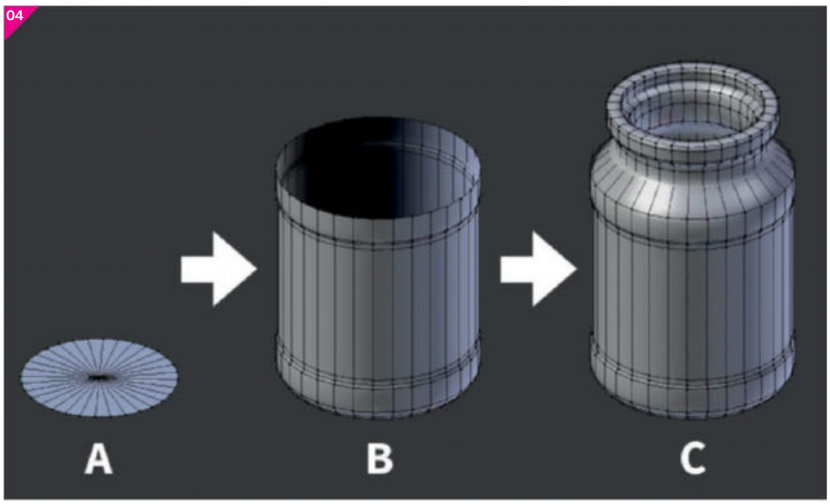
02 Build your references This is the stage where you put your researching skills to the test. Exhaust all your available resources: Google search, actual photos, tangible objects, sketches and so on. This will give you a better understanding of how certain materials and textures behave, especially if you couldn't have found them elsewhere. It will also give you more options to choose from in terms of colours and details. It strengthens the concept and idea that you already have, exposing other aspects that you might have missed.

Make a connection
Regardless of what genre you are working on and what style it has, make it believable as much as possible – this ensures that your viewers can relate to your piece and not just see a bunch of pixels on screen screaming colours and values. Create a visual harmony with the elements of your scene that will reinforce the message and story you're trying to convey. At the end of the day, it's the message that is most powerful in your artwork.

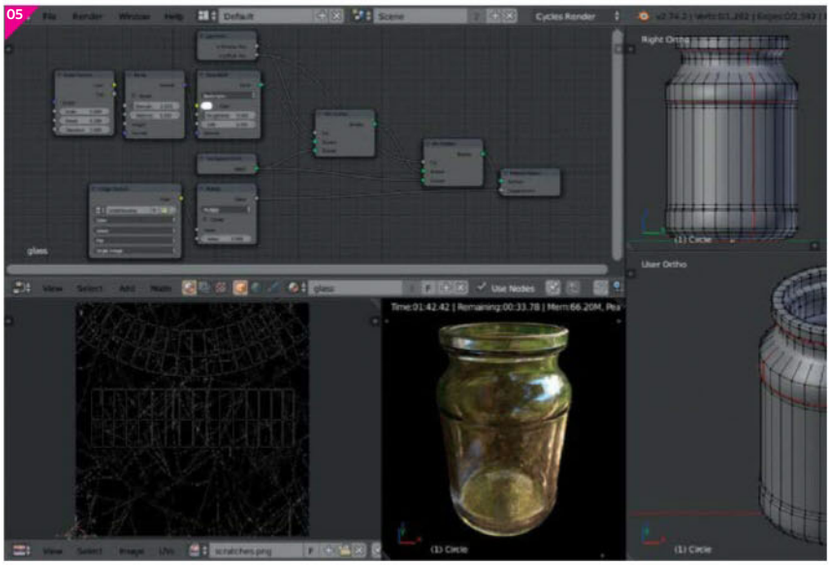


03 Block the scene Once your goals are clear, it's time to actually start the creation process. This is one of the most daunting stages of a project and skipping it can demotivate you. However, once you're aware of this fact, it's easy to counter it. No matter how complex your model and scene will be, breaking it down into manageable bits and pieces gives you more control over the resulting output. The best way to do this is to use primitives like cubes, spheres and cylinders to average the scale of the scene as well as their relative relationship with one another. You can then decide if one angle or aspect of your composition is working or not, before spending time on the laborious details later on.

“The better you’ve planned ahead, the smoother your project creation will be”



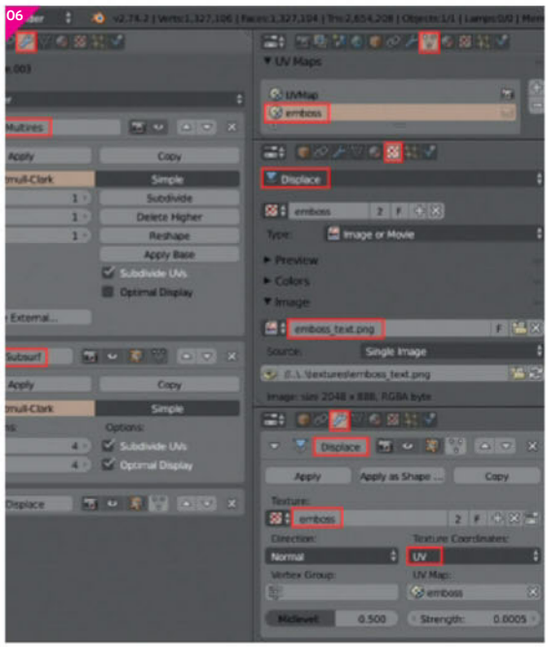
04 Model the glass jar To create the main subject of the scene, we'll use traditional poly modelling techniques. Start off with a circle with 32 vertices triangulated and merged in the middle. Select the outer edge and perform several extrusions and scaling. Continue with this procedure until you have completed the base shape with thickness. Finally, apply a Subsurf Modifier to smooth the object. Keeping the topology as simple as possible enables us to have more control over the form and will ease the process of texturing later. This same principle is also used in modelling the cup, saucer and books in the background.



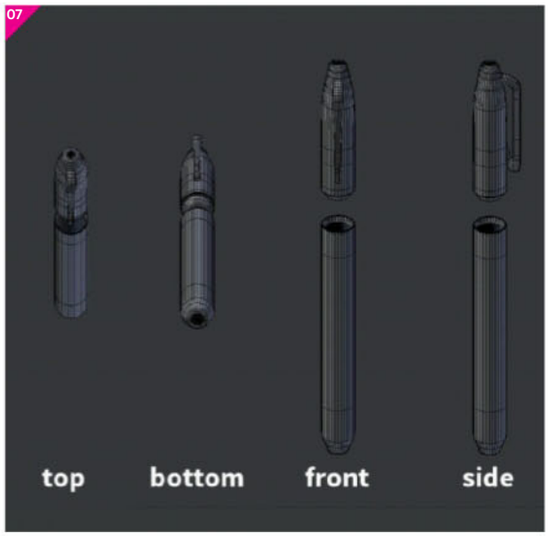
05 Texture the glass jar Since the glass jar takes up most of the visual information of the scene, it is necessary to add more realism to it by adding convincing textures. Create a simple UV map of the model and assign a scratch texture, which will indicate slight wear and tear, but keep it subtle. You can also add a Noise Texture and use it as a Normal map for the shaders, which is basically a mix of the Glass and Transparent Shaders. Doing this creates the illusion of depth and breaks the uniformity of the glass refraction.

Simplify as much as possible

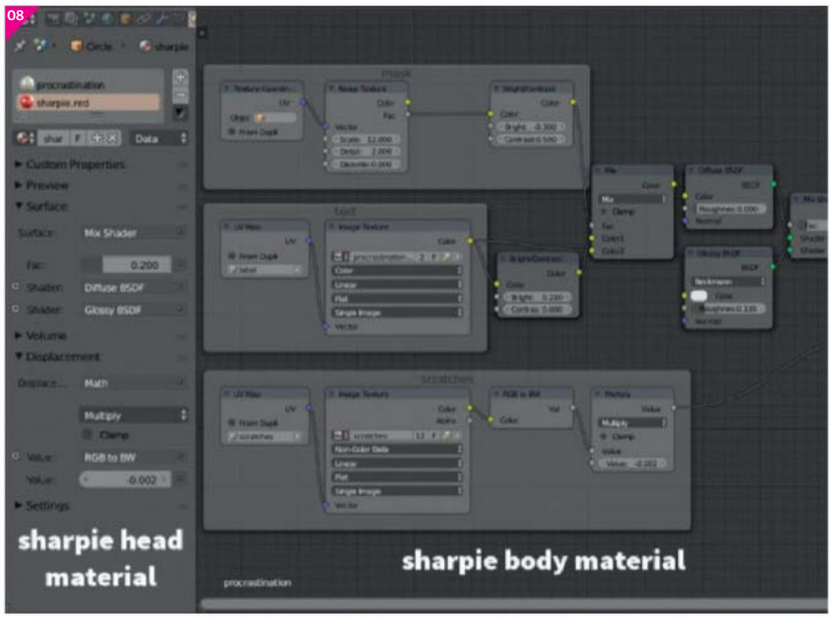
Often as artists, we are tempted to add extra details that wouldn't otherwise be seen. This is good if you have all the time you need, but in most scenarios, it's best to keep the details in moderation where needed and emphasise the necessary complexities in the main subject of your shot or scene. Not only is this beneficial to your time as an artist, which means you can work on more important things, but this is also technically more efficient, saving your computer the computation needed to calculate extra details (poly, texture sizes and so on). Work smarter, not harder.



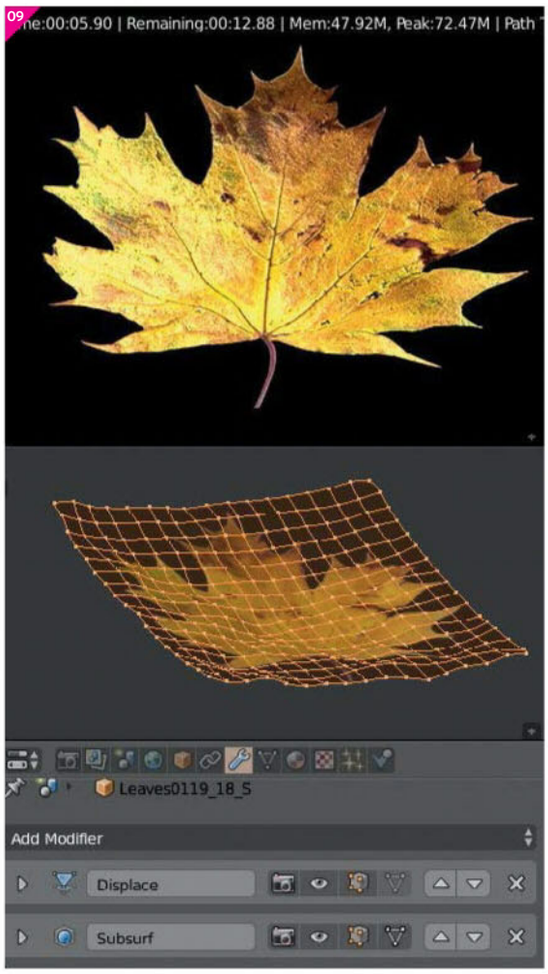
06 Create the displacements The text on the bottle might not be noticeable but it is this kind of subtle detail that adds believability. Using image textures as shader displacement might work well; however, doing the mesh displacement method looks more convincing in terms of how light behaves when it strikes the object's surface – at the cost of more polygons and memory. To do this in Blender, create a separate UV map, add a Multires Modifier to ramp up the amount of subdivisions, as well as adding a Subsurf Modifier to further pronounce the density, and finally using the Displace Modifier with the image texture assigned to create an embossed effect.



07 Model the Sharpies Using the same technique described in Step 4, we'll build the Sharpies starting off with a filled circle primitive, while keeping the scale relative to the glass jar. Duplicate the finished model and position them manually. There have been several attempts to try to automate the process via rigid body physics but it ended up too chaotic and unpredictable; doing it manually will give you more creative freedom as to their composition and arrangement.



08 Texture the Sharpies To achieve the colour variation for the Sharpies, a separate material is assigned for the head portion. The same is true for the body, which contains different texts used as image textures. Doing it this way makes it easier to tweak the individual material settings however you wish. The Sharpie heads are a simple combination of Diffuse and Glossy Shaders with scratch displacements. The body, however, is a little more advanced, utilising several nodes to get the unevenness of the surface and texture.



09 Add the leaf Using the 'Image as Planes' add-on in Blender, you can add image textures with transparency masks easily. But the real beauty is in tweaking the material settings. Using a very simple Diffuse and Glossy Shader mix, you can achieve a fairly realistic leaf without having to do any complex modelling. However, if the leaf would have been in focus, there might be a need to model it instead for more clarity and realism. This texture trick works for this scene since the leaf won't be much in focus.

> Using a very simple Diffuse and Glossy Shader mix, you can achieve a fairly realistic leaf

Showcase

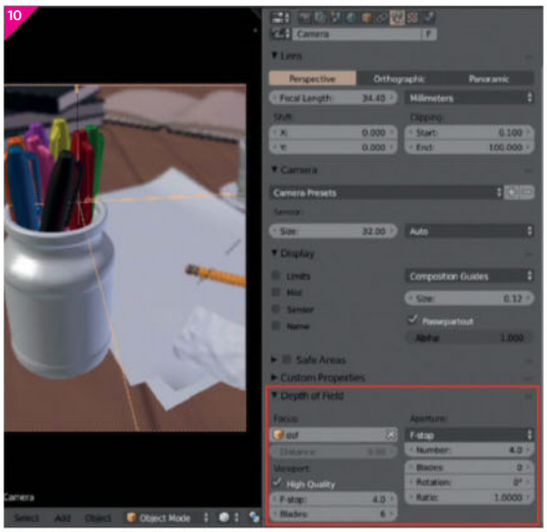
Reynante M Martinez

A self-taught artist and a Blender user for 11 years, Reynante specialises in visual storytelling and lighting. He has a background in graphic design, photography and illustration to name a few, with industry experiences that include academic teaching, art direction for short films and architectural visualisation.

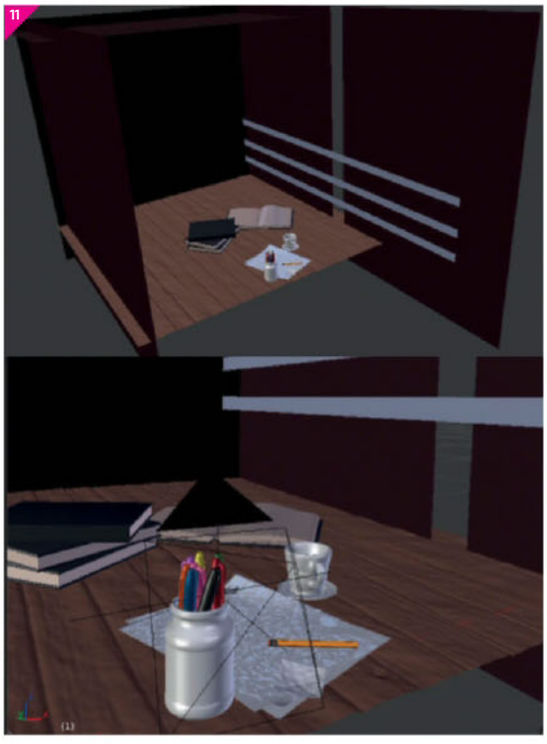
Rock On **Blender, Cycles (2015)**
This is my tribute to the scorching hot season that occurs in my country (Phillipines).

Fear **Blender, Cycles (2014)**
Inspired by a spontaneous idea that thoughtfully made its way into my consciousness on a random day.

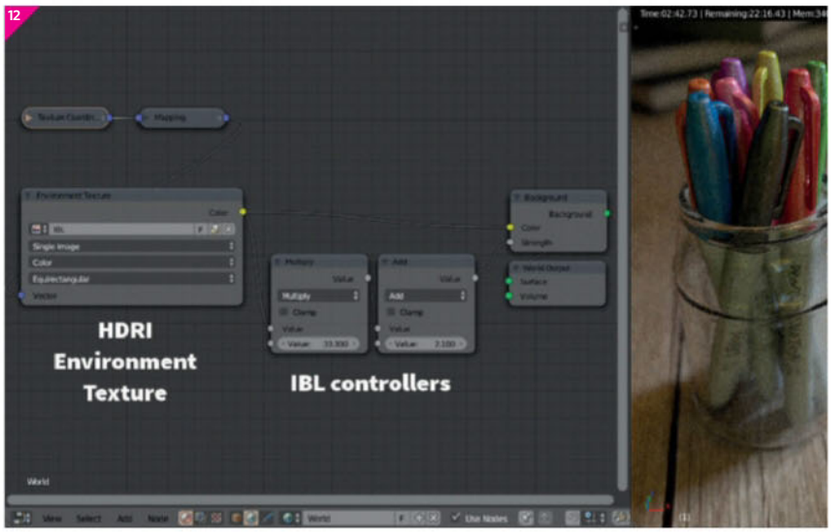
Playtime **Blender, Cycles (2015)**
Another doodle to express my odd imaginations and to detract from my usual routines for a while.



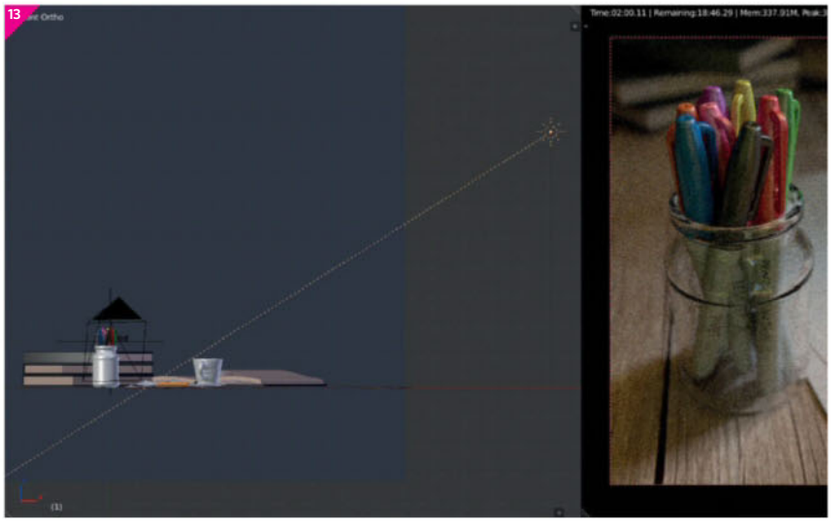
10 Set up the camera Once your models are set up, it's time to create a composition which will highlight and/or hide the elements in your scene. For some, this is one of the most crucial stages of the workflow process because composition plays a huge role in telling your story. In Blender, the Camera is just like any other object where you can apply rotations and translations as you wish. And to further emphasise your subject, you can use an Empty object as your 'Depth of Field' (DoF) focal point, while dialling the F-stop settings to control how shallow the blur effect is.



11 Fake the interior environment Often, it's not wise to entirely design the interior architecture of a project, especially when the focus is solely on an object where everything is blurred out. However, adding simple shapes to block out the basic form of the space is sufficient to create an enclosed space where light could bounce in as well as creating shadowed and unlit areas.



12 Image-based lighting (IBL) Using high dynamic range (HDR) images has been one of the most effective ways to illuminate a scene. Often, even with the absence of any lamp types. However, one downside to using them is that they take up too much memory, which is most evident when using large images with a high-bit depth. To balance this out, have an alternative lower-resolution image with a relatively higher bit depth than ordinary images like JPG or PNG. These IBLs also provide a great environment reflection on reflective objects. Via the node system in Blender, you can tweak and enhance the effects of IBL, where you can create more pronounced shadows and higher light intensities.

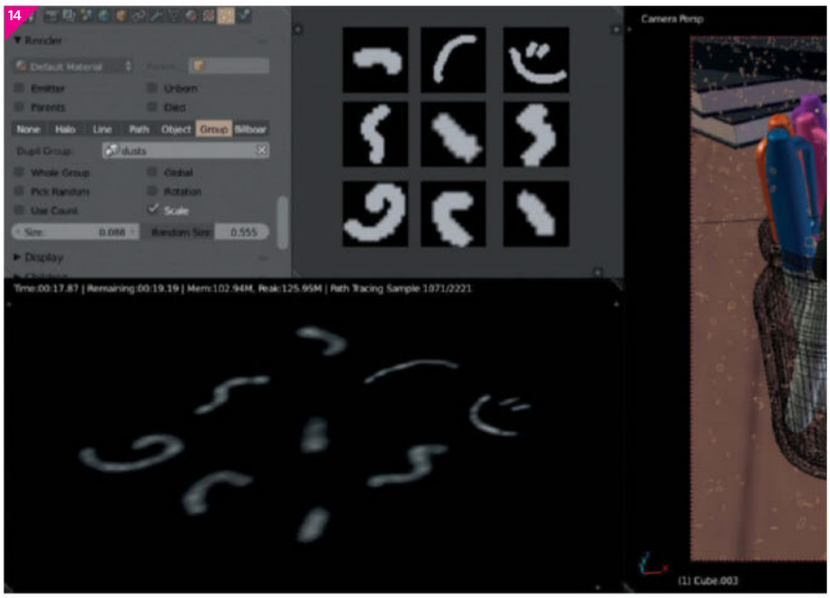


13 Additional lighting with Sun This step is optional. Adding extra light sources to your scene can make or break the intended visual composition. Always ask yourself what the purpose is to adding the lights. In this case, we are adding a Sun Lamp to further exaggerate the shadows and enhance the silhouette of the objects in the scene. To fully utilise this, use the lamp's size controls to modify how sharp or soft the shadows will be. You can disable any extra information like Diffuse, Specular and so on, and just keep shadow casting active if you wish to.

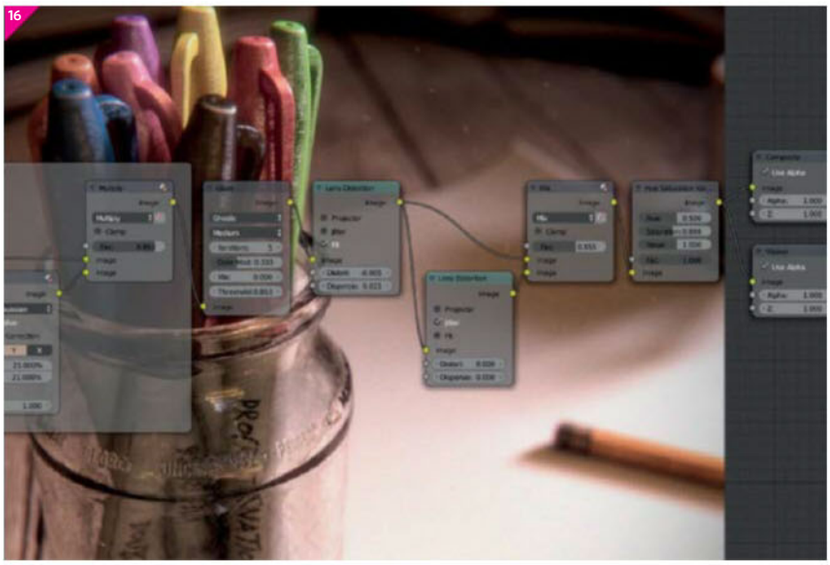
Composition with lighting

Lighting plays a huge role on how believable your scenes will end up looking because well-composed light rigs can amplify the details of your objects and make them pop even more than before. Lighting can even add contrast to the layers of your composition so that we get a harmonious relationship between all of the objects in our image. Make sure that you make full use of settings like energy/strength, size and colour to further enhance the overall look of your renders.

> Lighting plays a huge role in how believable your scenes will look



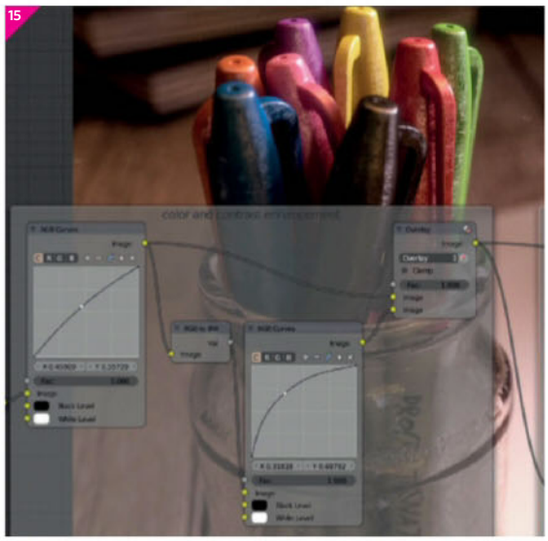
14 Create the dust Usually, dust effects are added in post after the image has been rendered, using tools like Photoshop or GIMP. However, adding them into the render gives you more realistic results like depth-of-field effects, volumetrics and the like. One way to do this is to draw random lines and use these images as Alpha masks mapped to planes, then using a particle system to distribute them across the entire scene.



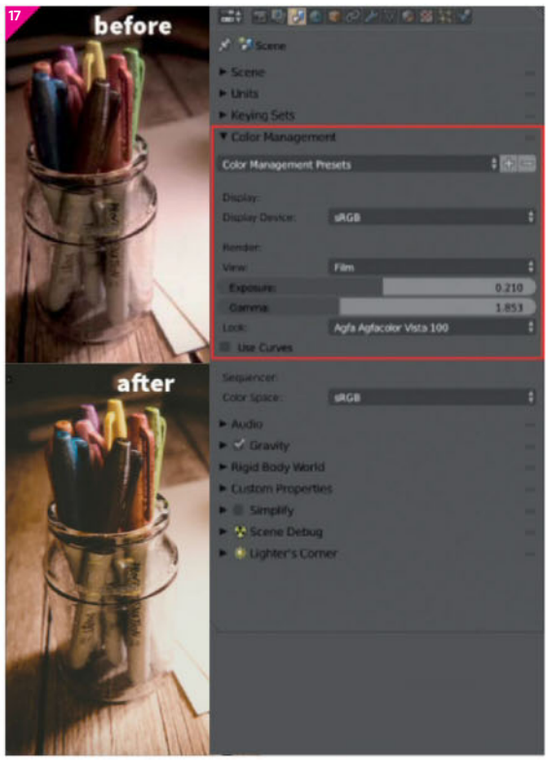
16 Lens effects Imitating traditional lens effects can add another level of believability and realism to your renders. This breaks the computer-generated look that your raw renders have. It will also psychologically imply a natural phenomenon that is usually seen through traditional and digital cameras alike. Camera imperfections like vignette, chromatic aberrations and grains are among others that imply realism. In Blender, these are available via the nodes carefully placed one over the other.

Animation postprocessing

Blender's Compositor is not only constrained to processing still images. Its true strength lies in animated sequences and/or RAW video files. Most of the settings (values, sliders, checkboxes) in each node can be keyframed according to any changes that have occurred in your animation and sequence. The processing of high-bit depth images like OpenEXR, HDR and Targa is also possible and is recommended when you want to perform any postprocessing operations.



15 Colour and contrast enhancements Postprocessing has already been a part of major artistic workflow since the past couple of decades – and this is true for photography as well. The trick to doing this lies in moderation. Using Blender's Compositor is a great way of nondestructively enhancing the render, which works best when the raw render's format is a high-bit depth image. Using several nodes, we can enhance the colours and contrasts of the image thereby adding more visual quality.



17 Film emulation To finish the postprocessing effects on the image, apply a combination of film effects, preset looks and gamma adjustments. There are no hard rules to this and it's best to use your own visual taste and judgement. As mentioned in the previous steps, just make sure you keep it simple and subtle. In Blender, these settings are accessible under Scene tab>Color Management.

All tutorial files can be downloaded from: **filesilo.co.uk/3dartist**

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Construct a futuristic mech

Build a mech using Mayan/primitive elements, model with quads and make use of different materials

MARIANO TAZZIOLI
Hawk Mech, 2015

Software
ZBrush, Maya, 3ds Max

Learn how to
- Model concepts
- Fix common modelling issues
- Build complex pieces out of simple ones
- Model hard surfaces
- Use retopology
- Make a UV layout
- Clean the scene
- Texture
- Build high-resolution shaders
- Composite

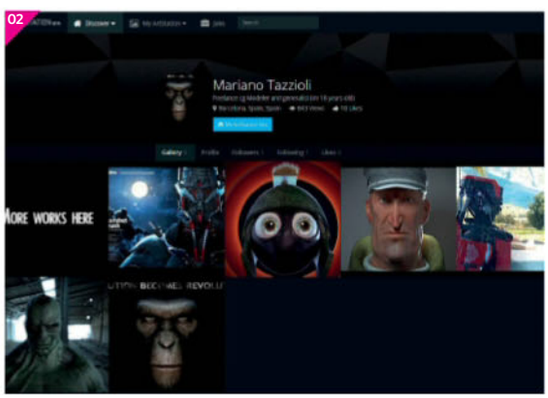
Concept
Since the beginning I knew I wanted to do a Mayan or primitive type of mech, so I started to look for references of Mayan art and then developed my idea from that.

YOUR FREE DOWNLOADS from **filesilo.co.uk/3dartist**
- Video tutorial
- Scene files

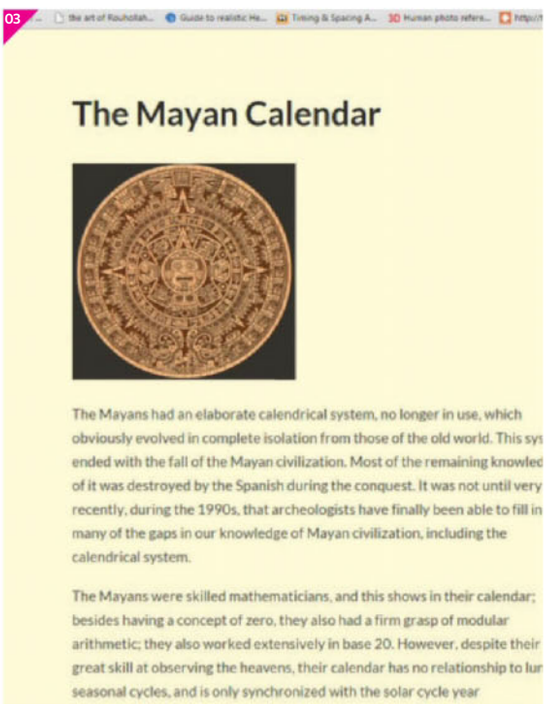
In this tutorial we are going to learn modelling skills, concept design skills, shading techniques and other things that are needed to create a convincing mech. The most beautiful part of the tutorial is when you are designing it because you are giving birth to an idea.

So we are going to start by learning how to do a quick and rough design, then we are going to pass it to Maya for doing the high-resolution model, where we are going to find common modelling issues and learn how to tackle the UVs. Once we have the model in Maya we will discuss the shading and texturing, we will cover how to replicate materials from real life, discuss concepts like Fresnel, glossiness, BDRF and so on. Finally we are going to learn about compositing, where we are going to give the render our final touches.

01 Come up with an idea The first thing to do is come up with an idea; a style that you want to follow. Start looking for references in that style. The proper thing to do is take your time to think about what type of artwork you are going to create. Don't forget that this is a creative process so keep an open mind and explore ideas.



02 Get inspired Next step would be to look into other similar pieces of artwork and look for any kind of inspiration that can guide you through the creative process, so check out these pages: **artstation.com**, **cgfeedback.com**, **itsart.com**, **cgmeetup.com**, and **zbrushcentral.com**. It's important to keep yourself inspired and up to date.

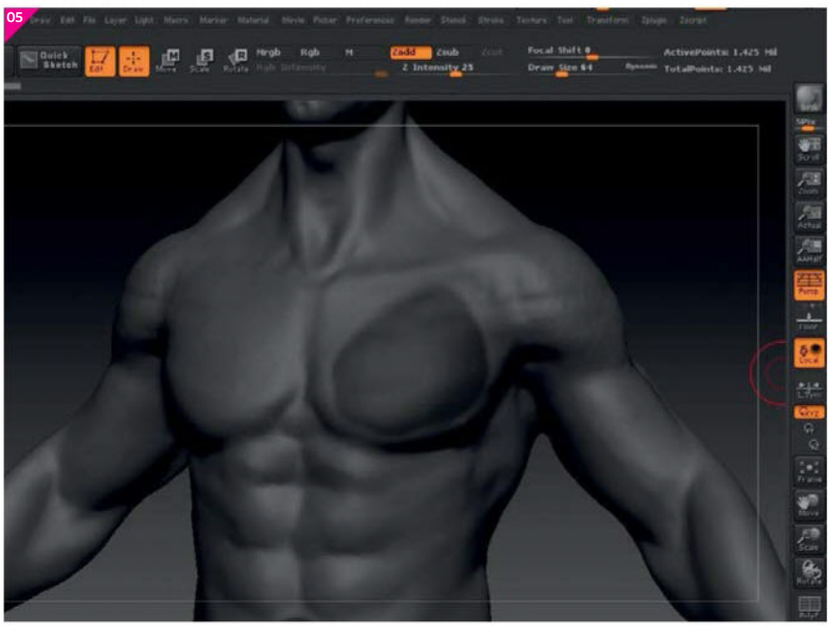

03
The Mayan Calendar
The Mayans had an elaborate calendrical system, no longer in use, which obviously evolved in complete isolation from those of the old world. This sys
ended with the fall of the Mayan civilization. Most of the remaining knowled
of it was destroyed by the Spanish during the conquest. It was not until very
recently, during the 1990s, that archeologists have finally been able to fill in
many of the gaps in our knowledge of Mayan civilization, including the
calendrical system.
The Mayans were skilled mathematicians, and this shows in their calendar;
besides having a concept of zero, they also had a firm grasp of modular
arithmetic; they also worked extensively in base 20. However, despite their
great skill at observing the heavens, their calendar has no relationship to lur
seasonal cycles, and is only synchronized with the solar cycle year

03 References Once you decide the style that you are going to follow, it's important to gather as many references as you can in that style. Referencing is important because it keeps you focused on following the lines of design that you can compare with your project.

Keep an open mind
Since this is a creative process, it's good to keep an open mind and keep trying things. If something doesn't work change it with something else; you can make radical changes to a design element if you think it's really necessary. So in that way you always keep your mind active and you will keep looking at new ways of making your design look cooler.

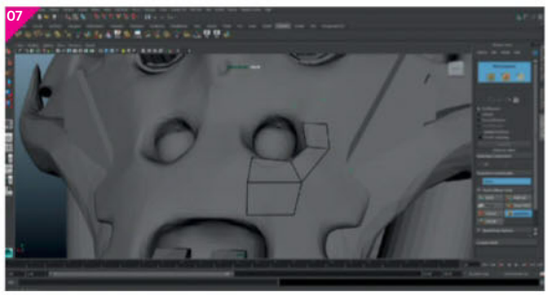
“Referencing is important because it keeps you focused on following the lines of design that you can compare with your project”

04 Start sketching ideas Once you know more or less what you want to do, it's time to get into ZBrush and start to sketch some ideas. Now you don't have to model everything perfectly here or define anything necessarily, you just have to do a rough design so that later you can start the final model and this will only serve us as reference. Here we are using ZBrush for the design.

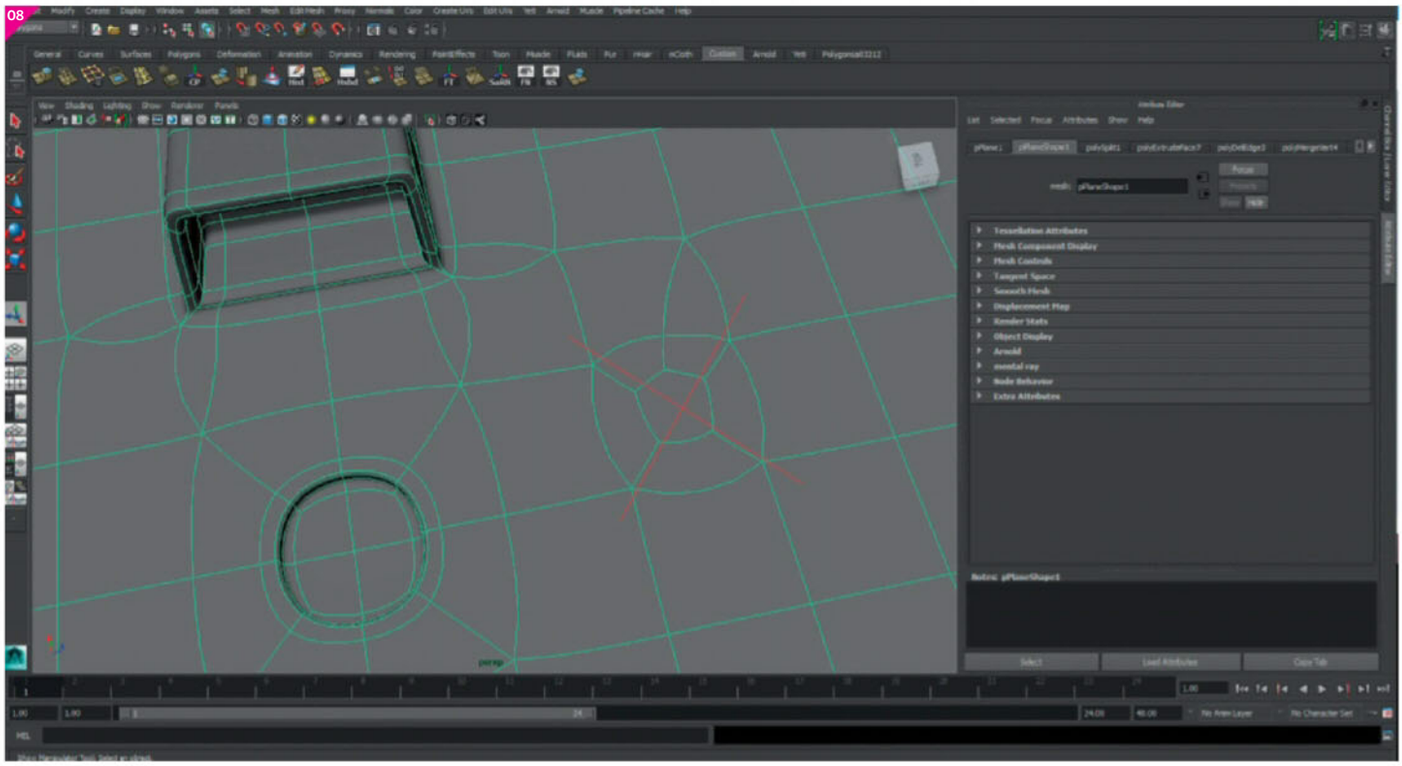


05 Moving things around As this is a purely creative process, you can start moving and creating geometry separately – so the workflow that we use for this type of artwork is always the same. We start from a base mesh, then we start to mask parts, extract and deform geometry to create the shape we want, or we can just create a new primitive and start deforming it as well. However, by extracting you can stick this piece of geometry to the base mesh to follow the shape.

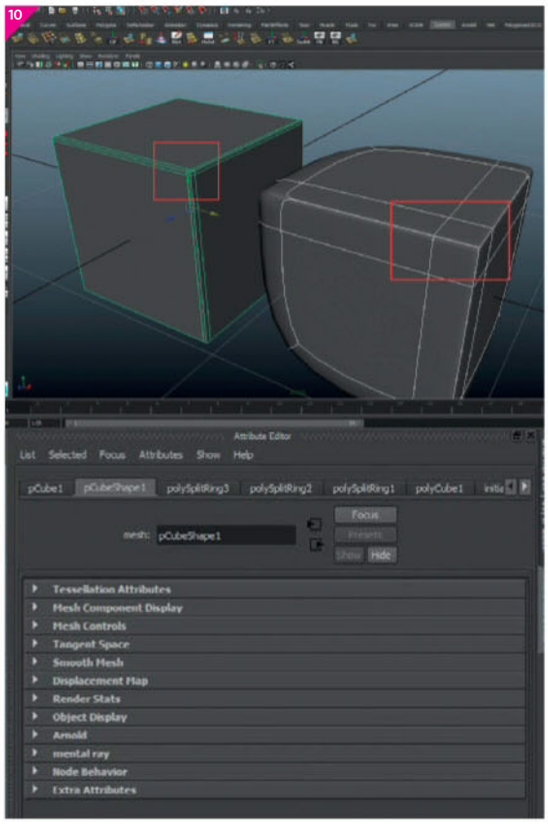
06 Open your mind This is a creative process so if a design element doesn't work, just try something else. It doesn't have to be similar to the previous element – you can make a radical change, but don't settle with your design. Keep changing things and if it looks right then good, and if it not then try something else.

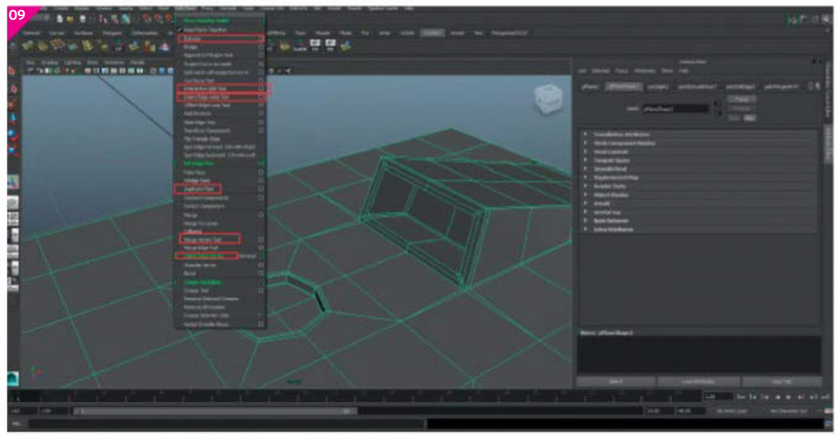


07 Move on to the final model Once you have your design finished, import the rough design to Maya by first decimating it in ZBrush. Once in Maya you can start to do the retopology of the pieces or model them. Since in ZBrush we did a quick design, all the pieces are undefined so now in Maya it's time to define them and give them the final look. The more you can define in ZBrush, the less work you'll have to do later.



08 Modelling techniques Quads are your friends, and triangles are kind of your friends – the ones that are not friendly are the ngons. In hard surface, since the pieces are not supposed to deform, you can keep triangles where the topology may require them, but try to always have the maximum amount of quads available to you.



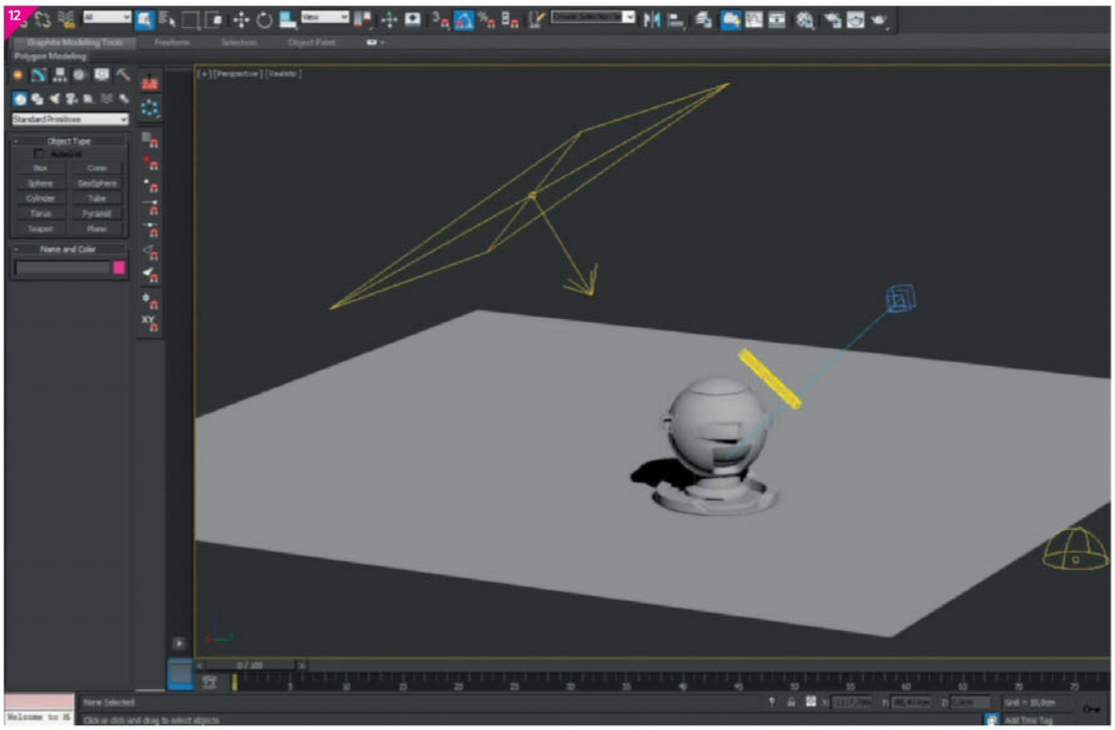


09 Common tools Although the final design may look complex and it may have lots of details, all the pieces are done in the same way by using the Extrude, Knife and Merge tools. The illusion of complexity is done via the repetition of elements and the union of various simple pieces. As shown in the video tutorial, all of this can be done by using simple primitives, duplicating them and giving interesting breakups to the pieces. It works in the same way that you can achieve a sense of depth by repeating columns with a long straight line as you do in 2D art. Here you can achieve the complexity by repeating and varying the same elements.

10 Optimise the model Only use the quantity of loops that you really need for your model. For a hard edge you only need three loops, as you can see in the image to the left: there is a main loop and then only three more loops for support and for creasing the edge. The closer those loops are together, the harsher the edge; putting more edge loops in will only make your scene heavier.

Reference

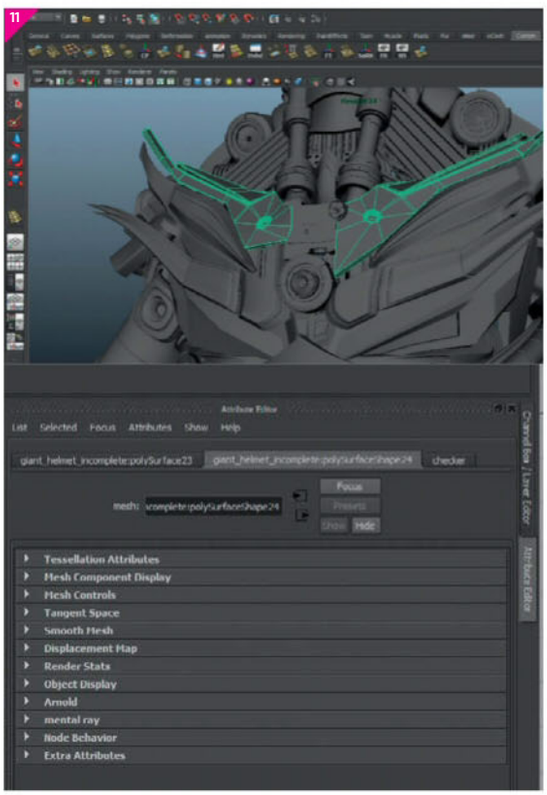
It's a very good idea to save all the references that you like, for example use a huge reference library of other artist works as a reference point to study from and for inspiration. You can learn a lot by simply observing other artists and their work. If you are lucky, some of these artists may also provide you with some tutorials or techniques that you can learn from.



12 Build a shader ball

For testing and defining the shaders, it's a good idea to build yourself a testing shader ball and put it in a scene with an HDRI and a few more lights to put some highlights in the scene. That way you can develop your shaders in this ball with a simple but effective light rig and develop the shaders consistently as well.

> It's a good idea to build yourself a testing shader ball and put it in a scene with an HDRI and a few more lights



11 Simplify your UVs

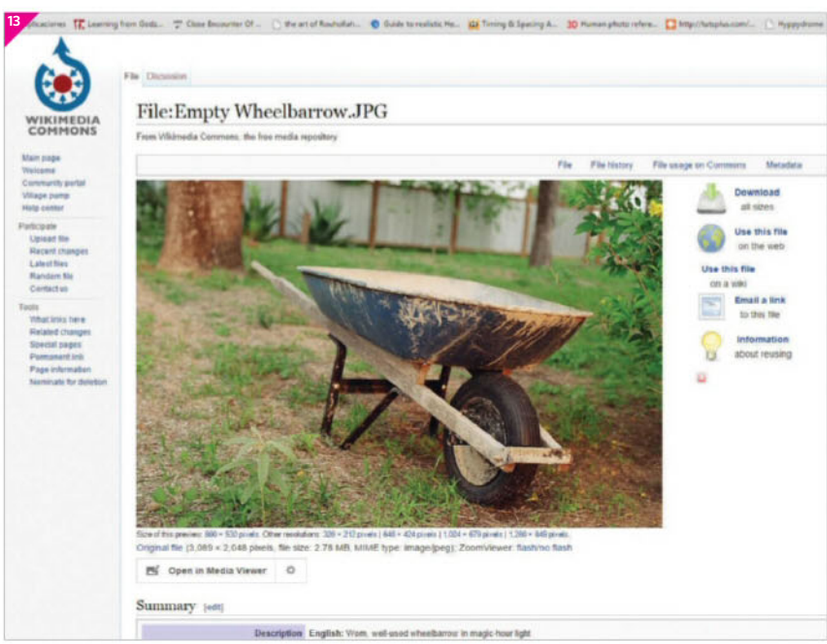
Once you finish modelling it's time to do the UVs. The UVs can look complex but remember that this complexity can be achieved if we make sure that there is a union of simple pieces. With this method, you will end up with a very complex piece made up of simple ones and with it will come easy UVs too. Another thing you can do is: when you are giving a double surface to a piece, instead of extruding it you can select the border edges and extrude them so that you only have those edges instead of a back face.

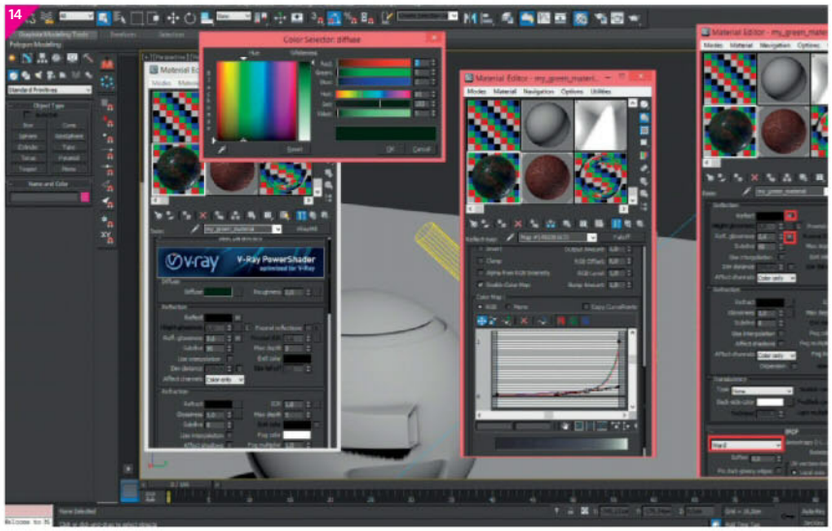
Always keep updated

A good thing to do is obviously never stop learning; keep searching for and developing new techniques that will enable you to arrive at the same result but quicker and more efficiently. Learning things like Python is a very good idea because it allows us to achieve more of what we want easier.

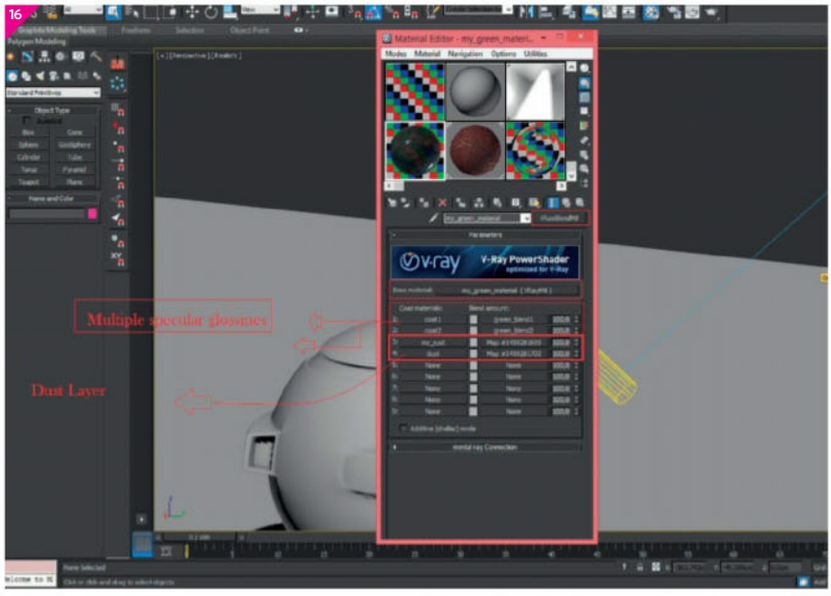
13 Analyse the shader

A great resource for learning shading is the course by Grant Warwick (**masteringcgi.com.au**). We are going to be using V-Ray for shading and the first thing to do is look at your references and identify the components of the shader you are trying to re-create: if it's metal or plastic, whether it's made up of one or two or more coats, whether it's the same material or if there are more than two materials used. For the latter, take a look at this wheelbarrow below, which is of a blue material with dust on top (a different material).





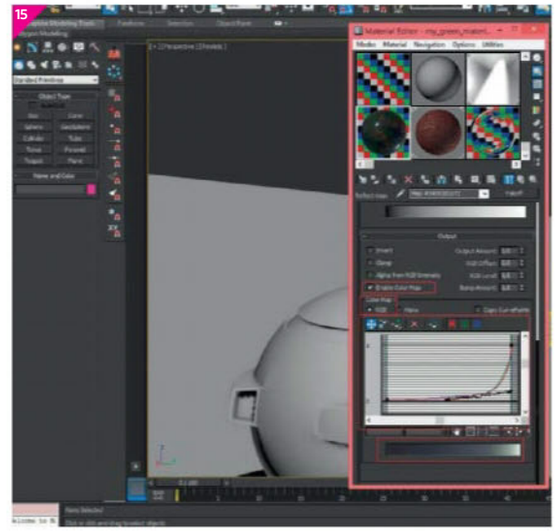
14 Define the shader Create a V-Ray Standard material and try to match the colour of the base material. Untick Fresnel in the reflections, put in a Falloff map, then in the ouput tab tick Enable Ramp. Now you can define the Fresnel curve – Fresnel is the effect where the reflectivity increases as we start to look at the object with angles close to 0 or 10 degrees and the reflectivity decreases as we start to look at the object with 90-degree angles. If you know more or less which material you are trying to re-create then you can look up the reflectivity curve, for example on the page **refractiveindex.info**.



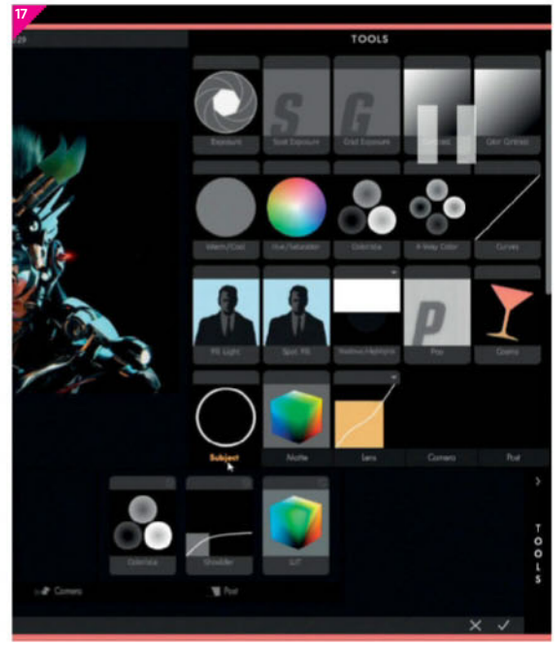
16 V-Ray blend materials To create multiple coats of material you will need to create a V-Ray blend material and then choose the material that you want as your base shader and also as your base coat in your V-Ray blend. Then, for creating a layer of dust, create another V-Ray material and put it as coat1 and follow the same steps as before but change the colour to a more brown desaturated colour. Next put in an image as a mask in the blend1 slot to add a dust layer on top of the base shader. Another cool feature that we can use here is the V-Ray dirt material and you can use this to add dust in the more occluded areas.

Look at real-world materials

One thing that you should is to always look at real-world materials and analyse them to understand what is going on. Move around the object that you're physically looking at to understand how it reacts to different viewing angles and lighting. That way you will see common patterns in the materials, like fingerprint details that almost all materials have.



15 Parameters and modes We will be using two very important modes in this step: mono for a black-and-white reflection, and RGB, which allows you to control different colours independently and tint the overall reflection. In the glossiness setting, try your best to put in a number that matches the reference, then for breaking a bit of the specular you can output a map in the glossiness. Another important parameter for you to consider is the BRDF: this is a function that determines how the specular is distributed along the surface. Ward works fine with metal, and phong or blinn works for plastics and similar materials.



17 Compositing Once we import the render into After Effects we can add curves to add more contrast, and then use a beam effect to define the rays from the eyes in Add mode. If we want to add some glow effects, for example in the red spots, you can create a red solid and use a mask in Add mode to create this effect. Then for a more sci-fi look you can use optical flares. You can also use Magic Bullet, which is a very nice plugin for adding final touches to the piece (**redgiant.com/products/magic-bullet-suite**).

Technique focus

Incredible 3D artists take us behind their artwork

SPACESHIP DESIGN This is one of my redesigned units for the game *StarCraft*, using vulture and hellion. Baneling is a Zerg, organic creature, so I tried to imagine how it would look as a steampunk machine. Baneling was a challenge as it has a specific shape. The scene is a dried river bed full of banelings, and an old factory is functional in the background.

Tamas Gyerman
cinemorx.cgsociety.org

Tamas is a CG generalist who loves to create lights and atmosphere in his images

Software Cinema 4D, V-Ray, ZBrush, Photoshop

Baneling, 2015

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Model by Steve Talkowski
Sketchbot.tv

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Awaken a beast with ZBrush

Model, pose and texture a monstrous creature's life cycle and its natural setting

In this tutorial we will go through the steps to create a posed and detailed creature. Starting with only a sphere we will create the rough form of the creature and use ZSpheres to add limbs. We will also make use of readily available Insert Multi Mesh brushes to add features to the creature. After posing the creature we will use Polypainting to create basic materials and textures on the model. Finally, the 3D renders will be taken into Photoshop to finish the composition by adding lighting effects and textures. We will also cover how to export and render the model in KeyShot from ZBrush 4R7.

> It is a good idea to choose an Alpha material to paint with to blend colours in a more natural way

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WWW.IMAGINESHOP.CO.UK

JAMES SURET
Newborn, 2015

Software
ZBrush, KeyShot, Photoshop

Learn how to
- Use ZSpheres to create the basic form of a creature
- Use Insert Multi Mesh brushes (IMM brushes) to quickly add features
- Pose the creature using masking and Transform
- Use Polypainting to paint materials and textures directly on to the model
- Create multiple render passes to create a high-quality final image
- Render the model using KeyShot for ZBrush

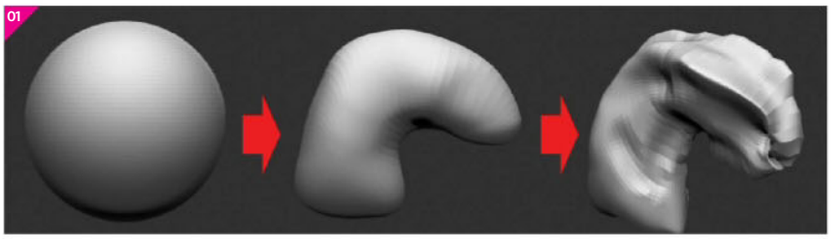
Concept
The aim of this project is to create a detailed and expressive creature and its natural habitat.

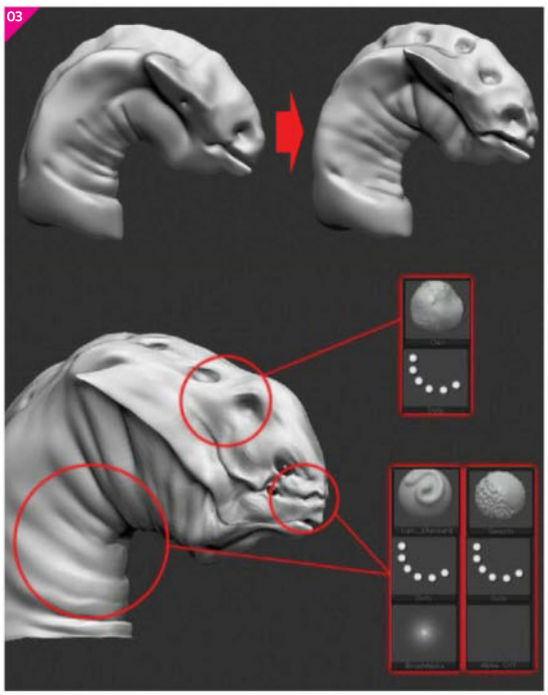
YOUR FREE DOWNLOADS from **filesilo.co.uk/3dartist**
- Tutorial screenshots

01 Create a rough bust
First insert a new sphere. Press T to edit the object and click Make Polymesh3D, also activate Symmetry by pressing X. Now with the Move brush set to a large size (by pressing the] key), push the shape around. The idea is to quickly explore your ideas without worrying too much about what the details will be. At this point it's sometimes useful to look at reference images of the anatomy of real animals or insects.

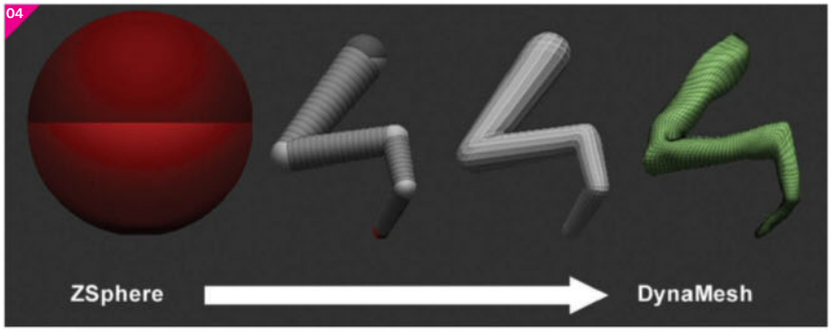
02 Develop the model using DynaMesh
Now we have a very rough form but the mesh is becoming difficult to sculpt because of its topology. We need to use the DynaMesh feature to even out the surface of the model. We can then continue to pull out the basic form of the creature. When it feels like the polygons are stopping you from adding more detail, just use the DynaMesh feature again but with a higher resolution. At this point the polygon count is quite high and we can start using the Clay brush to carve in smaller features such as the eye sockets and skin folds.

03 Sculpt the initial details
The next step is to add character and realism to the model by sculpting basic skin folds and muscle structure. Using the ClayTubes and Smooth brushes we can quickly create the look of skin folds or wrinkles. The Dam_Standard brush is great for carving lines and wrinkles as well as carving out the mouth and nostrils. During this stage you may need to use DynaMesh again to smooth the mesh out. Next, add the eyes by inserting spheres. Then mirror the spheres using the SubTool Master plugin and move the eyes into place with the Transform tools.

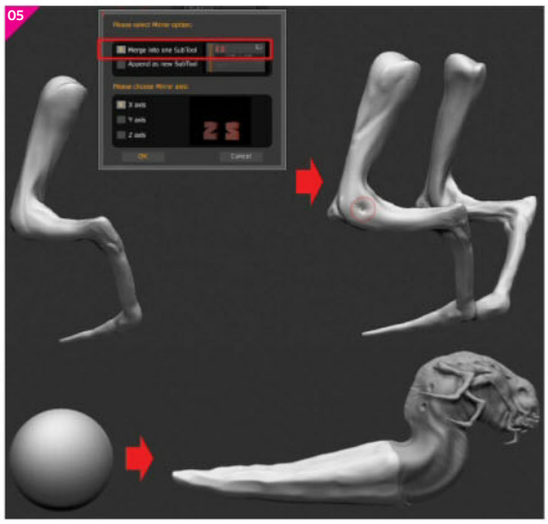


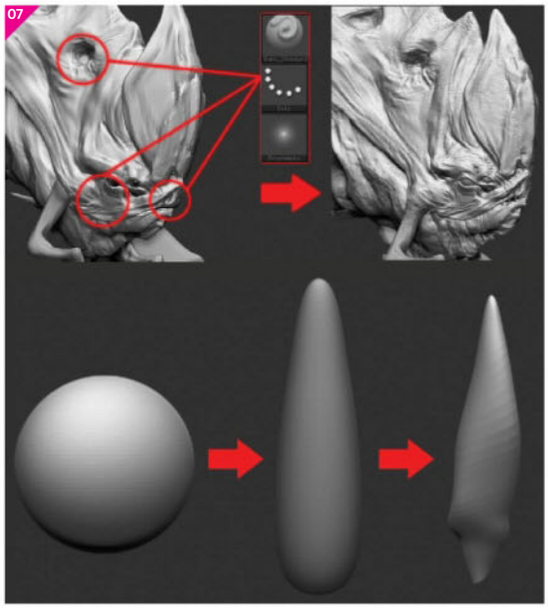


Choosing a full body or bust
When you start a new character you may not be sure how the entire character will look. It's a good idea to concentrate on sculpting a bust, as this helps you develop your character. You can always create the rest of the character from ZSpheres or Insert Meshes and merge it with DynaMesh. In ZBrush 4R7, when you use DynaMesh on a SubTool with multiple objects merged, it preserves the individual objects' Polygroups.



04 Create the arms with ZSpheres
To create the forearm we will start by inserting a ZSphere into the model. Press Q and you can draw out a new ZSphere and after pressing W you can drag the new sphere out further to create the first part of the arm. By repeating this process you can create the basic form of the arm, the Scale and Rotate tools can also be used. When you are happy with the arm click on Make Adaptive Skin under the Adaptive Skin menu. This new SubTool can then be added to the main SubTool, it's usually best to run DynaMesh before sculpting further.





05 Develop the anatomy

Now we have a sculptable arm we can mirror the SubTool using SubTool Master menu under Plugins, if you choose the option to Merge into one SubTool you can then press X to enable symmetry on the arms. Then using the Move and Clay brushes you can build up the anatomy of the arm; consider where the joints will protrude and skin folds might hang from. To complete the creature we can now add a new sphere and pull out the basic shape of the lower half of the creature's body and tail. Now use DynaMesh to prepare the SubTool for sculpting.

06 Use Insert Multi Mesh brushes

Now that one set of arms is sculpted you can add more by clicking Duplicate in the SubTool menu. The new arms can then be resized and moved by making use of the Transpose tools. To speed the modelling process up we can add some legs to the creature by using a premade Insert Multi Mesh brush pack available for free at **badking.com.au**. Once the brush set is loaded up you can then click on the side of the creature's body and drag out the size of the leg that you want it to be. Then you can use the Transpose tools to position it.

07 Detail the face

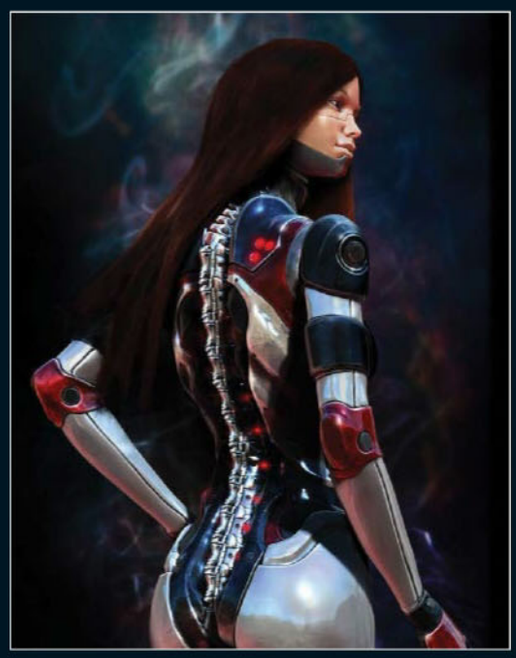
Now the large forms of the creature are complete we can focus on adding detail to the smaller areas. Using the Dam_Standard brush you can create more skin folds and wrinkles. It is useful at this point to use DynaMesh again at a higher resolution to enable you to sculpt these smaller details. We can also add in some teeth by starting with a sphere, pulling out the basic shape and then duplicating the SubTool as we did before when we were working on the arms.

Showcase

James Suret

I am currently a full-time web developer and freelance 3D artist. I am constantly developing my portfolio with the aim of working as a concept artist in the games/entertainment industry. My main focus is creating original creatures and illustrations.

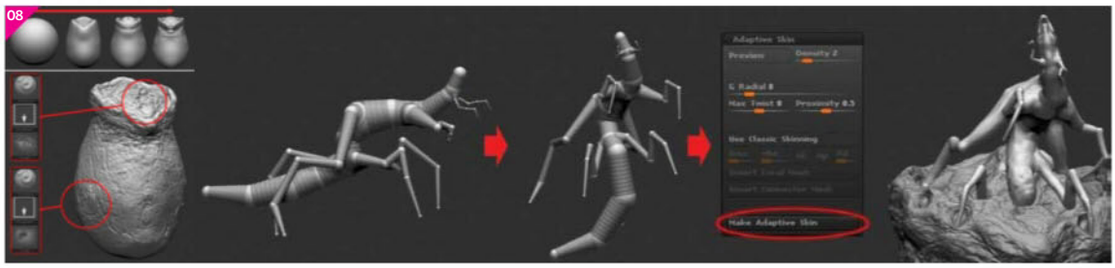
Oculus **ZBrush, Photoshop (2013)**
This sorceress character was sculpted in ZBrush, using Insert Multi Mesh Curve brushes to create the clothing.

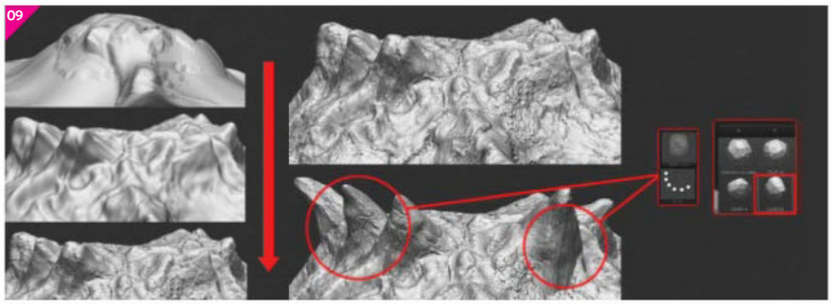


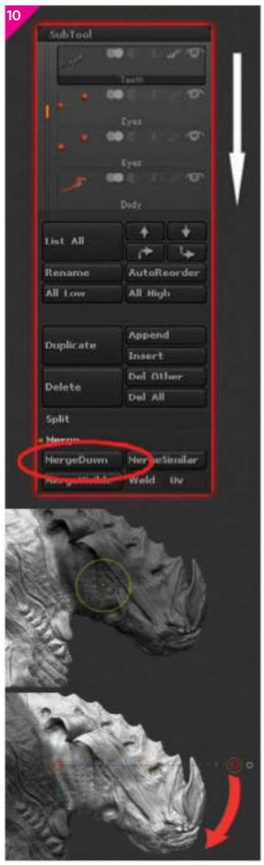
Nova-25**, Photoshop (2013)**
This is a futuristic character concept. I sculpted this female cyborg character in ZBrush, using FiberMesh to create the hair.

08 Create the egg and baby The egg is created by inserting a sphere and roughing out the shape with the Move tool. Then use DynaMesh and tweak the shape further. You can use Alpha materials to quickly sculpt surface details. To create the baby creature, make the basic skeleton from ZSpheres based on the anatomy of the original creature. Then move the skeleton inside the egg and position the limbs. To move the ZSphere model press W, hold Alt and click on the initial inserted ZSphere. After turning the model into an Adaptive Skin, use sculpting brushes to add detail.

09 Create the landscape Now we need to create a base environment for the creatures to exist in. Starting from a sphere again we can rough out a rocky platform with the Move and Clay brushes; use DynaMesh to smooth out the mesh after large changes. When the polygon count is high enough, use Alpha materials to add a rough surface to the model. Then load the IMM Clod brush that comes with ZBrush and insert some rocks along the surface. Use the Transpose tools to resize and rotate each rock as you are inserting them. You can now also duplicate the SubTool containing the baby creature. It can be scaled up slightly and positioned near the front of the egg with Transpose tools.





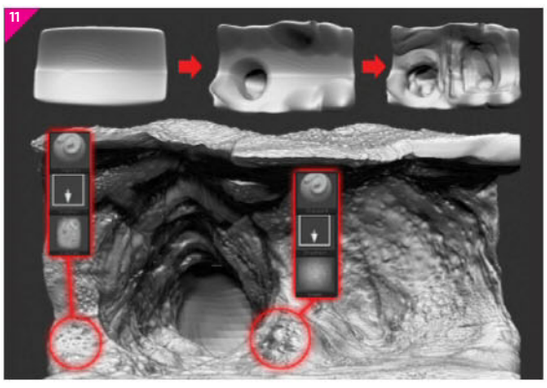


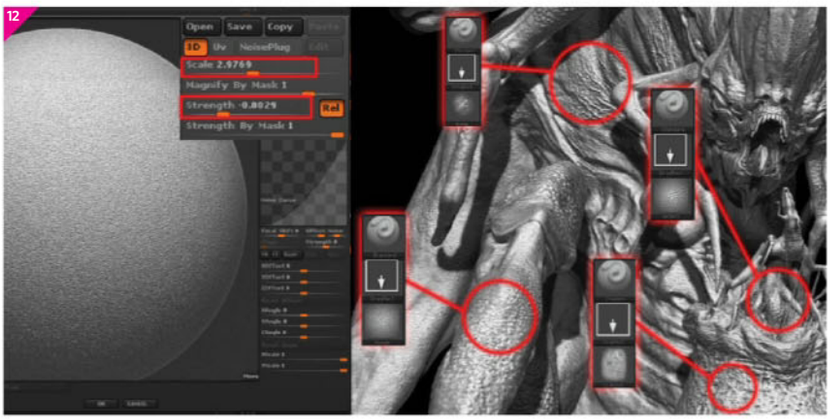
10 Pose the creature Now we can pose the creature to fit into the environment. Before we do it's a good idea to merge the eyes and teeth down into the main body SubTool so they will be posed together. Make sure they are listed underneath each other in the SubTool list before clicking MergeDown. With the body SubTool selected hold down Ctrl and paint a mask covering the head and neck. Turn off symmetry by pressing X, hold Ctrl down and click outside of the model to invert the mask. Press R and draw out a transpose line from the base of the neck outwards then drag the end of the line to rotate the neck. You can then use the same method to pose the rest of the body and limbs as well as the larger baby creature's limbs.

Posing forms

When posing organic characters you usually need to create smooth bends, for example, the neck or knee. When you are painting out a mask you can hold down the Ctrl key and lower the RGB opacity which will draw out a softer mask. This will create smoother, more organic bends. You can quickly blur the mask by using Ctrl+click several times.

11 Make the background Now that we have the creatures and the foreground ready we can make a quick background for the environment. Start by pulling out a sphere with the Move brush into a rough rectangle. Use DynaMesh and then pull a tunnel shape out of the back of the model with the Move brush. Continue shaping the cave and using DynaMesh to help sculpt more detail. You can also use Alpha materials to quickly add some texture but don't worry too much about sculpting details as the background will get blurred out in the final image to create a depth-of-field effect.





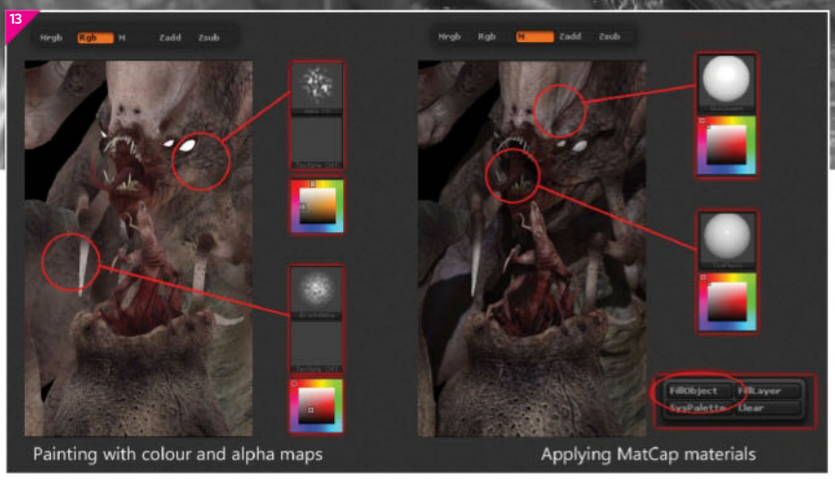
12 Final details Now to complete the sculpt we can add fine surface detail. Add a fine layer of noise to the model to make the skin look more realistic. Click on the Noise button under the Surface menu, here you can tweak the strength and scale of the noise. To apply this noise to the model click OK then Apply To Mesh. You can then use different Alpha materials to layer hard and sharp textures on the skin to create the look of bumps, veins and scratches on the skin. A great selection of free Alpha materials can be found at **pixologic.com/zbrush/downloadcenter/alpha**. Alternatively you can create your own from photos by saving them as greyscale PSD files.

avxhome.se

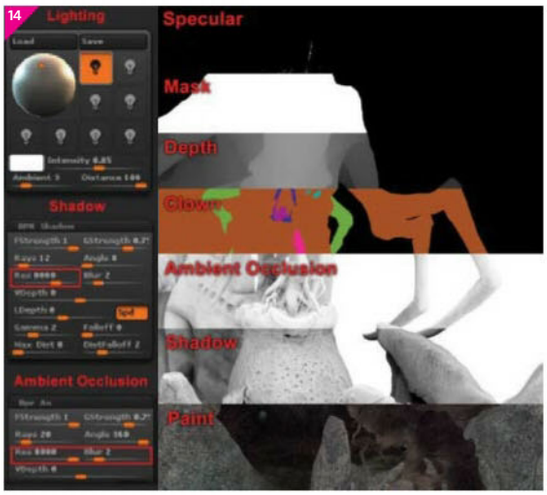
“Use different Alpha materials to layer hard and sharp textures on the skin”

Polypaint with masks

After you have finished painting the creature a good way to bring your sculpted details back out is to use the Mask By Cavity button under Masking, then invert the mask. Now you will have all the deeply carved details selected, such as skin folds and pores. You can then paint with a darker skin colour over these areas only. Clear the mask and you will be able to see the difference it makes.



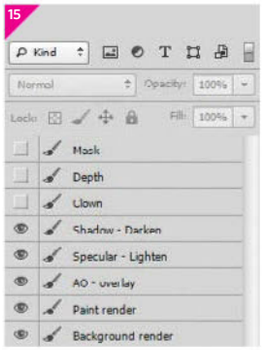
13 **Polypaint the base textures** Firstly, fill the model with a plain material by clicking MRGB and selecting MatCap White01 as the material and FillObject in the Color menu. Make sure ZAdd and ZSub are not ticked (so you don't accidentally sculpt on the mesh) and tick RGB (this will allow you to just paint in colour). It is a good idea to choose an Alpha material to paint with to blend colours in a more natural way. Then, apply some base materials to enhance the texture's shading. To do this make sure only M is ticked, select a material and click FillObject from the Color menu.

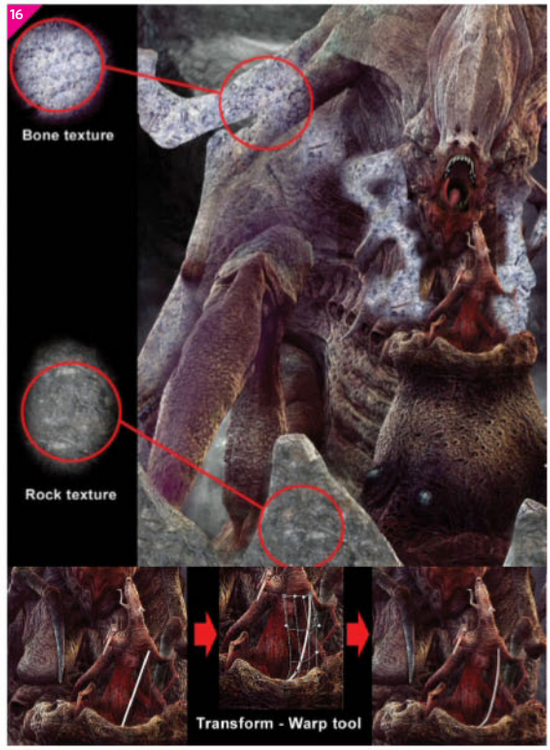


14 Lighting and rendering First we need to rotate the model to create an interesting composition. Then select the background SubTool and press the Solo button to only show this SubTool. Use the BPR render to create the background image. Next turn off Solo mode and hide the background SubTool. Move the light placement by moving the dot around the sphere under the Light menu. Set the shadow resolution to 8,000 on the BPR Shadow section of the Render menu to create higher quality shadows. Enable Ambient Occlusion under Render Properties and set the resolution to 8,000. Click BPR to render and save all the render passes. To create a specular render, fill the model with Toy Plastic material and black colour. Finally we will create a clown pass render to help select individual parts of the model in Photoshop. Fill each SubTool with the Flat Color material and fill each part with a different colour, then render this out.

15 Composite the layers in Photoshop After saving the renders as PSD files open them in Photoshop and layer them up. First the background render and then main BPR render, followed by the AO layer set to Multiply which helps add more depth to the render. Next, set the specular layer to Lighten which brings out highlights along the skin. Finally, set the shadow layer to Darken to enhance the dark areas. The mask layer can be used to delete the background of the renders to enable you to place the background render behind the character.

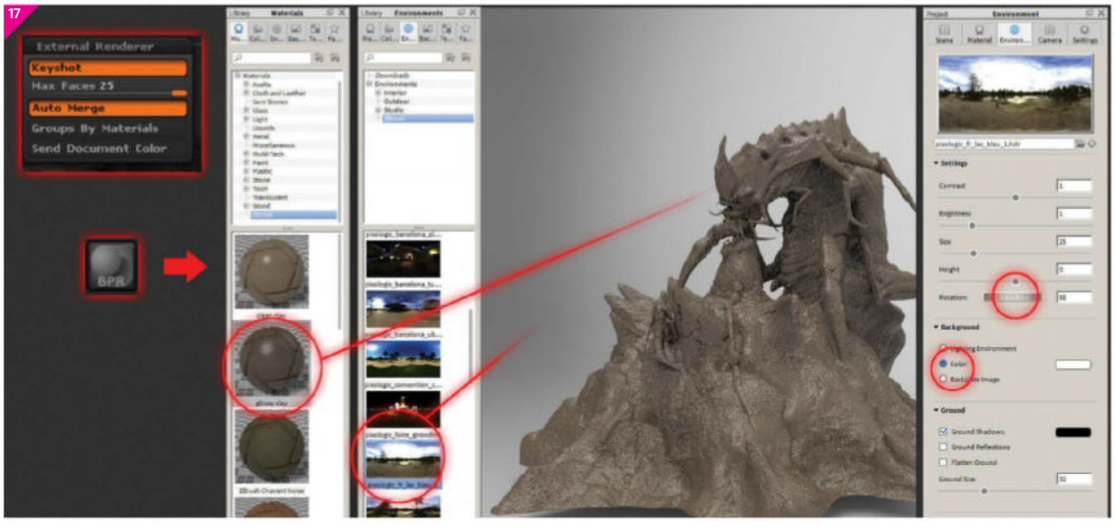
16 Add effects and textures Apply a strong Gaussian blur to the background to create a depth-of-field effect. Next, insert stock photos of skin and bone to enhance the textures on the character; set them to Overlay and reduce the opacity. Using the Clone Stamp tool you can paint these extra textures on different parts of the creature. A great selection of free photo textures can be found at **cgtextures.com**. Finally, using a soft brush, add some soft lighting and glow effects to the teeth, eyes and skin. This emulates reflected light and adds to the atmosphere of the image. To create the strands of slime/saliva you can draw a line with the Line Tool and then use the Warp transform tool to make it look more realistic.





17 Render in KeyShot Rendering in KeyShot is now easier than ever with ZBrush 4R7. Simply load your model as normal and click on the External Renderer button under the Render menu, then hit the BPR button. The model and all of its texture/materials will be sent to KeyShot. If you want to create a realistic clay render you can apply one of the clay materials that comes with KeyShot. For more realistic lighting, load one of the HDR environments, set the Background to Color and choose a light colour. You can also rotate the lighting by using the slider under the Environment tab. When you are happy press Render and choose your resolution.

> To create the strands of slime/saliva you can draw a line with the Line Tool and then use the Warp transform tool to make it look more realistic



The right view

When trying to decide the best camera angle for your final render, consider the Rule of Thirds or the golden ratio. Render a camera angle that you like and overlay an image of the golden ratio (search Google Images), see if the image's features match up with the spiral centre and then adjust the camera angle accordingly.

All tutorial files can be downloaded from: **filesilo.co.uk/3dartist**

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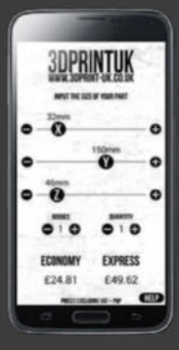

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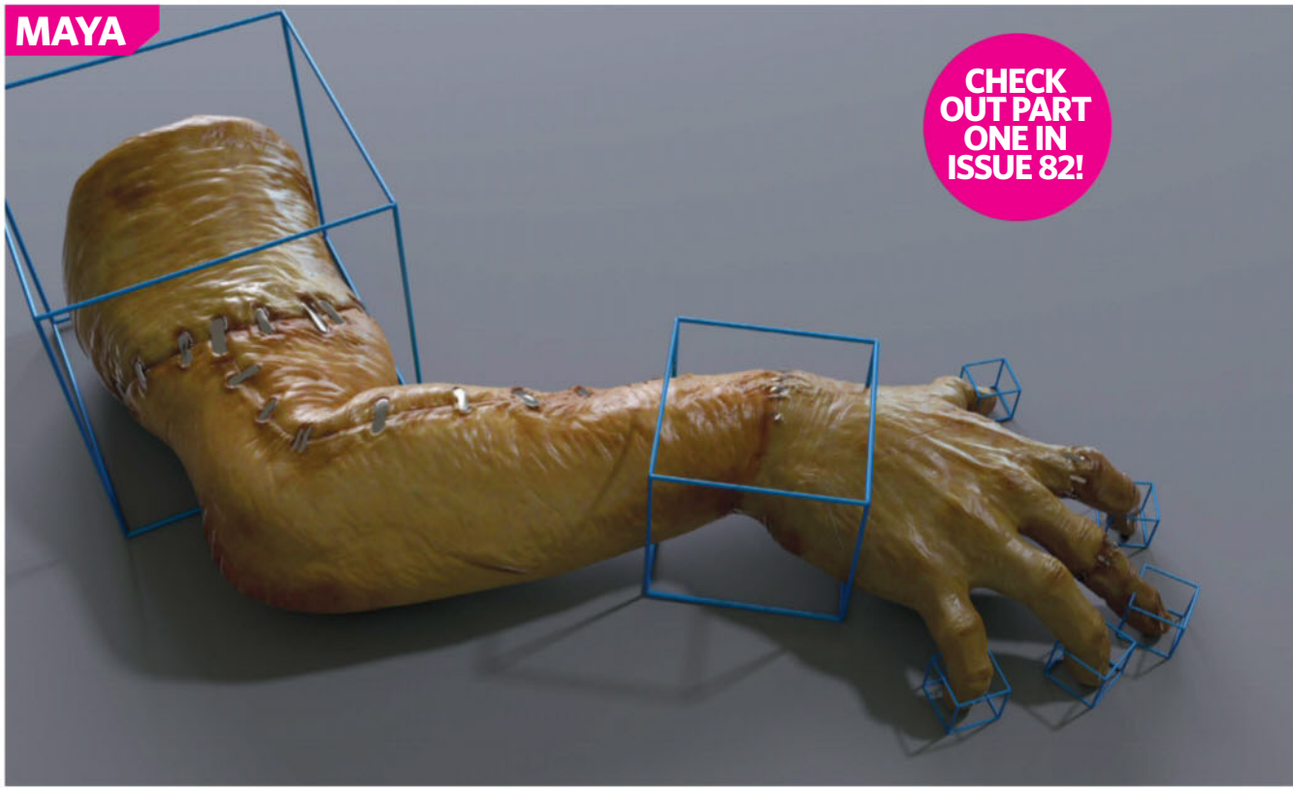


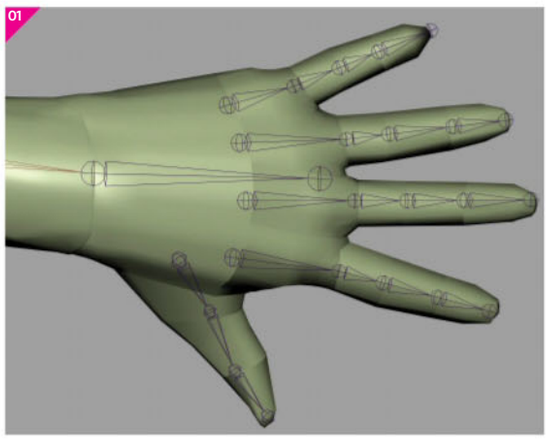
CHECK OUT PART ONE IN ISSUE 82!

Use Set Driven Keys to rig a hand

In this tutorial, we will continue working on the arm rig from where we left off last time in Part 1. This time, we will focus on the fingers. We normally use an FK-only based setup and use Set Driven Keys to hit a range of poses quickly, with additional controls to pose each digit of the fingers. On this occasion, however, we will use the fingers to interact with a ground plane (imagine the Thing from the Addams Family). We are going to go for an IK-based setup that then drives an FK rig. This will let us keep the fingertips locked to a certain position but still offset each digit should we wish to do so. We'll also add the functionality that the IK rig can either follow or not follow the main arm rig. That way, if you wish to animate the fingers in FK mode only, the IK won't stand in your way.

We've prepared scene files for you so we can kick things off straight away. You'll find the start file on FileSilo in: scenes/02_rigging/part2/00_start.ma. This is pretty much where we left off last time; the only difference is we've gone in and chopped up the low-resolution geometry for the fingers.

01 Create the finger joints Let's get things going by creating the finger joints. Jump into the Front view and create a five-joint chain for the index finger. First click at where you feel the metacarpal joint should go, then at the first knuckle, then at the second knuckle, at the third knuckle, and lastly, create a joint at the tip of the finger. As you create the joints that will sit in the finger, add a slight arc to the joints (like a rainbow) so that the IK handle will be able to pick up the bend point. Next, select the root joint of the new chain and go to Skeleton>Orient Joint (Options). When the dialog box pops up, set the Primary Axis to X, the Secondary Axis to Z and the Secondary Axis World Orientation to Z (-). Positive Z rotation should now be flexing the fingers. Now rename the joint chain from root to tip like so: 'indexA_bind_jnt', 'indexB_bind_jnt', 'indexC_bind_jnt', 'indexD_bind_jnt' and 'index_end_bind_jnt'. Jump into Top view, select indexA_bind_jnt and hit Cmd/Ctrl+D to duplicate the joint chain. Select the root joint of the duplicated chain and translate it for the middle finger. Repeat the process for the ring finger, pinky and thumb. For the thumb, delete the end joint as it has one too many and rename the joints.



02 Position and rotate all the finger joints

Now that we have all the main joints, start positioning and orientating them into place. Remember that you can translate and rotate the root joint in any axis but for all children joints, you should only use Translate X. You can, however, rotate all the joints on any axis. Once you have positioned all the joints, go to Modify>Freeze Transformations to remove all the rotational values. With the joints in place, select the <finger>B_bind_jnt of each chain and hit Cmd/Ctrl+D to duplicate it. Select all the duplicated joints now and go to Modify>Search and Replace. In here, set the 'Search for' to _bind_jnt and the 'Replace with' to _ik_jnt. You'll also need to go in and remove the one hanging on the root joint for all the IK chains now. With all our joints in place now, take the low-res geometry for the fingers and then parent the relevant piece under the relevant _bind joint, and we will do this so that we can check the behaviour of the rig as we go.

03 Create IK handles and controls

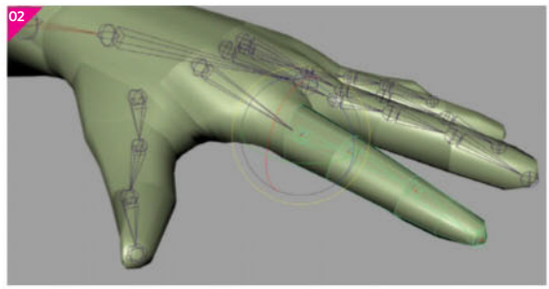
Select all the _bind_jnt chains and then hit Cmd/Ctrl+H to hide them for now so we can focus on the IK chains. For each IK chain, create an IK handle (Rotate-Plane Solver) starting from <finger>B_ik_jnt and ending at <finger>_end_ik_jnt. You should now have five IK handles. Make sure to go in and rename them like so: 'index_ik', 'middle_ik', 'ring_ik', 'pinky_ik' and 'thumb_ik'. Now select them one at a time and test how they affect the joint chain. If you are not happy with them, repeat Step 2 until you are. Next, create a control for each IK handle using the same process that we did in the previous tutorial, or like we have done here, simply duplicate the wrist_ik_ctrl and then use that shape. Here is a quick recap of getting the control to drive the IK handles: create a NURBS shape and rename it appropriately, for example name it like so: 'index_ik_ctrl'. Next, group the curve to itself twice. Then go ahead and add the suffix '_offset' to the top-most group and then '_sdk' to the group above the control curve. Next, move the _offset node to the same positon of the IK handle (in this example this will be: index_ik) it will control, and lastly, point constrain the IK handle to the control curve (index_ik_ctrl).

04 Create IK finger twist controls

Let's look at adding something similar to enable us to twist the fingers. Start by creating a NURBS curve (of any shape of your choice) and name it 'index_twist_ik_ctrl'. Then create the control hierarchy using group nodes as we have done in the past. Next, we will need to position the control. To do this, all you have to do is just select the following objects in this order: indexB_ik_jnt, indexC_ik_jnt, indexD_ik_jnt, index_end_ik_jnt, index_twist_ik_ctrl_offset, and go to Constrain>Point (make sure Maintain Offset is disabled). Now select in this order: indexC_ik_jnt, indexD_ik_jnt, index_twist_ik_ctrl_offset, and go to Constrain>Aim. With our control correctly aligned, go into the Outliner, select the two constraint nodes under index_twist_ik_ctrl_offset and then delete them. You can now select index_twist_ik_ctrl_offset and in Local translate mode, drag it out slightly so that it can be more easily selected than before. Next, select index_twist_ik_ctrl, then Shift+select index_ik and go to Constrain>Pole Vector. That's one down. Now just repeat this step for the remaining fingers. To add an extra method of twisting the fingers, add the attribute 'twist' to all the IK finger controls (leave the Min and Max blank). If you duplicated the IK wrist control as we have done, then this attribute will already be present on your IK finger controls. Now go to Windows>General Editors>Connection Editor, and add index_IK_ctrl to the left column and index_IK to the right column. Now just highlight 'twist' in both the left and right columns and we should be good to go. Again, you can repeat this step for all the other fingers.

Skinning the arm

Once you are happy with the rig, you'll want to use it to drive the geometry. You'll want to start by selecting all the _bind joints and dropping them into a Quick Select Set. With the joints still selected, add the arm that we want to bind to the selection and go to Skin>Bind Skin (Options) and use the following settings: Bind to: Selected Joints, Bind method: Geodesic Voxel, Falloff: 0.3 and Resolution: 1,024. All the other settings can stay as they are. Now test out deformations using the rig in both FK and IK modes.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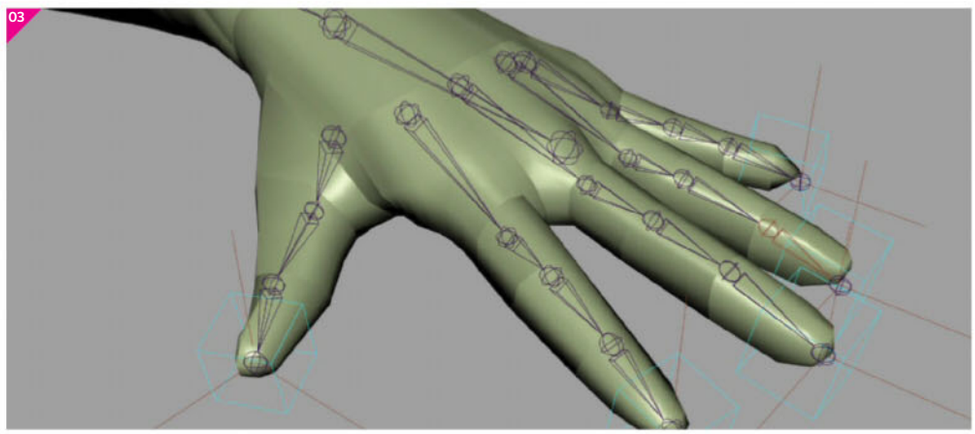
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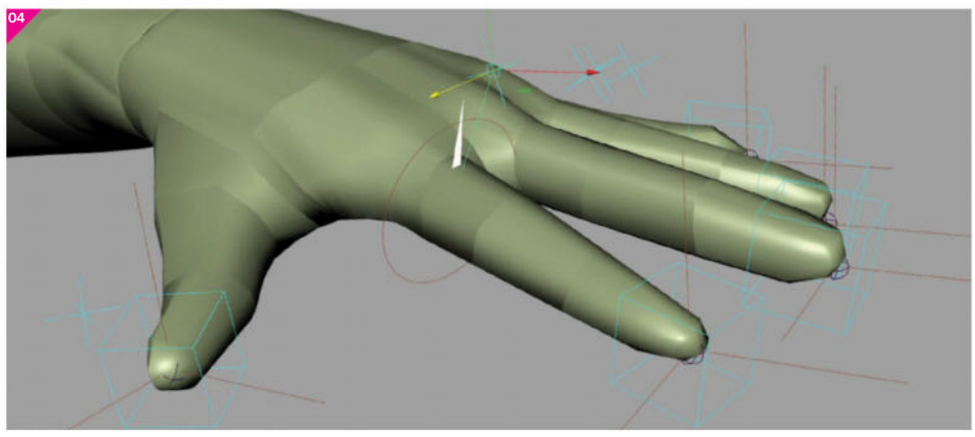
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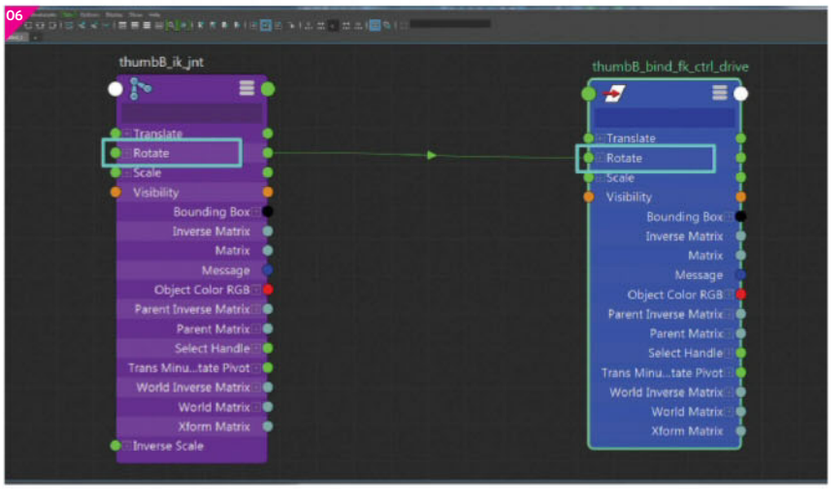
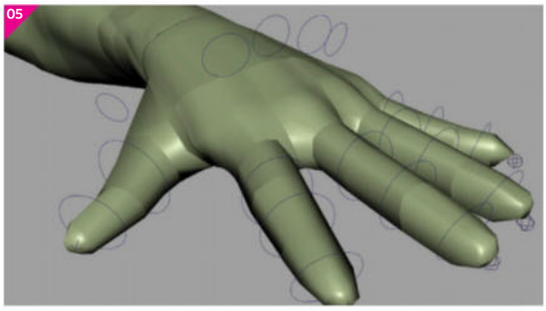
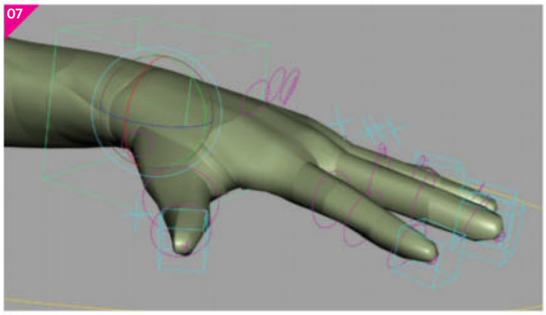
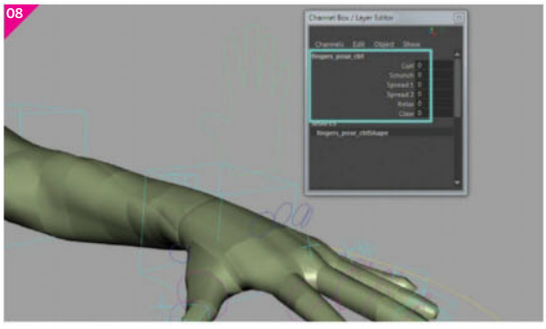
05 FK finger controls Now we'll turn to the FK controls. We've supplied a very simple script that will go in and create the controls for any selected object that has a name ending with _jnt. If you've used a different naming convention throughout your rig, just modify the script (it's pretty self-explanatory where) to make it work. Now, open up the Script Editor and in a new Python tab, click Load Script. Navigate to the scripts directory of the supplied Maya project and load the create_finger_ctrls.py script. By using this script, we will create an additional group within each of the controls' hierarchy structure (_drive). This _drive will be used to drive the FK controls using the IK joints. By doing this on a level above the _sdk group, we will still be able to create a range of poses with the fingers that the animator can quickly hit. To run the script, select all the _bind_jnt (excluding _end_jnt), hit Cmd/Ctrl+A in the bottom half of the Script Editor and then hit Enter to Execute it. For each finger joint now, you should see a control. If they are hard to select, use Component mode to play with their shapes. One thing the script did not do, however, is create the parent-child relationship between each control to mimic the FK hierarchy of our joint chain. We'll have to do that manually. For the index finger (you can repeat this for all the other fingers) select indexD_fk_ctrl_offset and parent it under indexC_ctrl. Then take indexC_fk_offset and parent it under indexB_fk_ctrl. And lastly, take indexB_fk_offset and parent it under indexA_fk_ctrl. The FK controls will now drive the rotations of the joints, they will not, however, translate the root joint of each finger. For this to happen, select in this order: index_A_fk_ctrl, indexA_bind_jnt and go to Constrain>Point. Now all you have to do is repeat this for the remaining root joints.









06 Connect the FK to the IK Now we will be connecting the output rotation values for the IK joints to drive the _drive group node on our FK controls. Let's tackle this for the index finger. Select both indexD_fk_ctrl_drive and indexD_ik_jnt, and go to Windows>Node Editor. Open both nodes up fully and then connect the output Rotate attribute of indexD_ik_jnt into the input Rotate attribute for indexD_fk_ctrl. Do the same for indexC_fk_ctrl_drive and indexB_fk_ctrl_drive. Then translate index_ik_ctrl around to see if it drives the FK controls. If all works well, repeat the process for the remaining fingers.

07 Connect the fingers to the palm If we move the arm controls around, you'll find that the fingers will stay as they are. Before we fix this, let's clean up the Outliner. Select all the finger root joints and hit Cmd/Ctrl+G, and then rename this group 'fingers_rig_grp'. Then select all the IK control _offset nodes and hit Cmd/Ctrl+G. Rename this group 'fingers_Ik_ctrl_grp'. With nothing selected now, hit Cmd/Ctrl+G twice and rename the top node 'fingers_ctr_grp_offset' and the group below 'fingers_ctrl_grp'. Select the _offset node and parent it under wrist_bind_jnt, zero out the Translate and Rotate channels to position the _offset group, and then hit Shift+P to unparent the _offset node. Lastly, take all the FK finger control _offset nodes and parent them under fingers_ctrl_grp. Next, select in this order: wrist_bind_jnt, fingers_ctrl_grp_offset and go to Constrain>Parent.

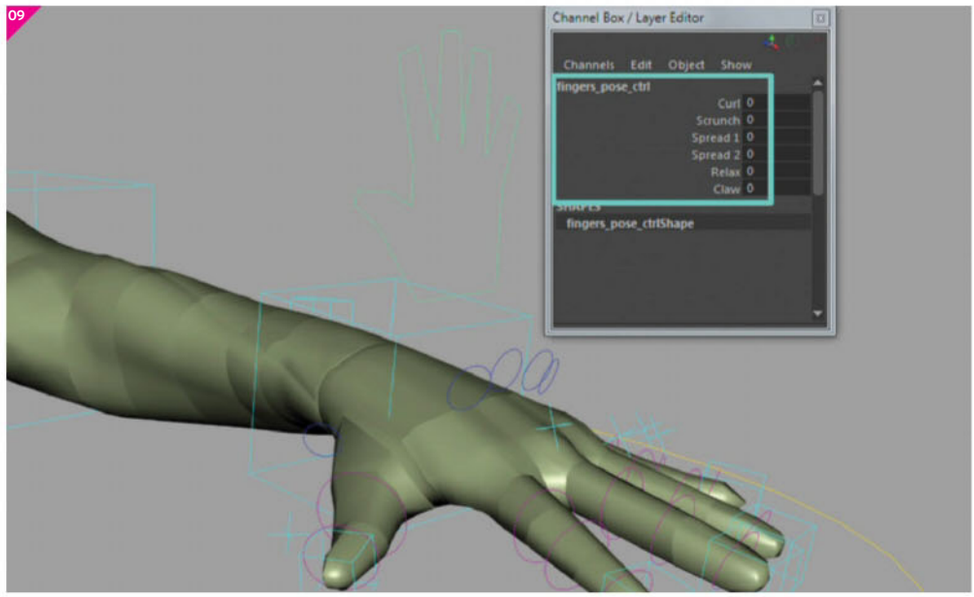
08 IK to follow or not follow We now want to create an attribute that will enable us to control whether the IK controls should or should not follow the rest of the rig. Before we do that though, and to make the tackling of this a speedier process, take the _offset node of each IK twist control and parent it under the relevant IK finger control. Now with nothing selected, hit Cmd/Ctrl+G twice to create two empty group nodes in a small hierarchy. Rename the top group 'fingers_ik_ctrl_grp_offset', and the group below 'fingers_ik_ctrl_grp'. Now select the _offset group, parent it to wrist_bind_jnt, zero out all the Translate and Rotate channels, and hit Shift+P to unparent it. Take all the _offset nodes for the IK finger controls, and parent them under fingers_ik_ctrl_grp. Select in this order: wrist_bind_jnt, fingers_ik_ctrl_grp_offset, and go to Constrain>Parent. Next, select fkIk_vis_switch_ctrl and go to Modify>Add Attribute. Create an attribute called 'ikFingers_follow' and give it a Min of 0 and a Max of 1. Now open up the Set Driven Key window and load fkIk_vis_switch_ctrl as the Driver object, and the parentConstraint node living under fingers_ik_ctrl_grp_offset as the Driven object. Make sure the IK Fingers Follow attribute is set to 0, check the Wrist Bind Jnt W0 (on the parent Constraint node) is set to 0, and hit Key on the SDK window. Then set both attributes to 1 and hit Key once more.

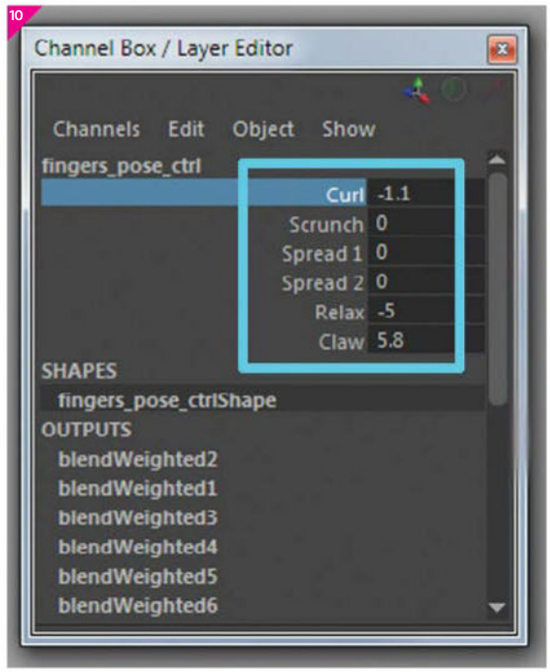
09 Finger pose control With the fingers now following the rest of the rig, let's look at creating some controls to allow the animator to pose the fingers quickly. For the control, use the CV Curve Tool and create a shape that mimics a hand's silhouette. Rename this control 'fingers_ctrl'. Translate and orient the control so that it sits close to the fingers, and scale it up if necessary. Once you are

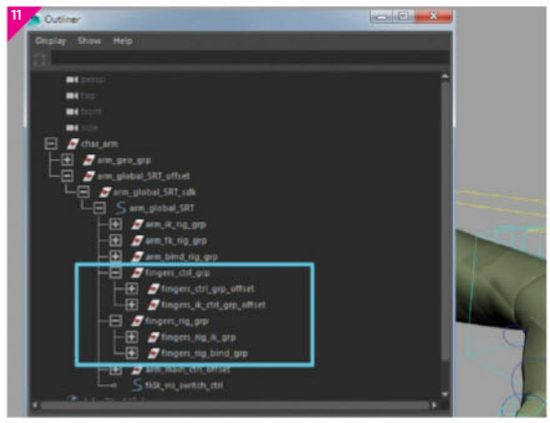
happy, parent it under fingers_ctrl_grp, and then with fingers_ctrl still selected, go to Modify>Freeze Transformations. In the Channel Box, highlight Translate, Rotate and Scale, and 'Lock and Hide' them using RMB. We now want to add some custom attributes that the animator can use to pose the fingers. With fingers_ctrl selected, go to Modify>Add Attribute and create the following: curl, scrunch, spread1, spread2, relax and claw, with the following settings: Data Type: Float, Minimum: -10, Maximum: 10 and Default: 0. You can also add additional attributes to drive each finger individually.

10 Drive the poses with SDKs With the attributes ready, select all the finger controls (other than <finger>A_ctrl), and press Up twice. This will let you pick-walk up to the _sdk level of each control (which is what we will use to drive the finger attributes). Alternatively, go into Outliner and select all the _sdk groups for the finger controls. With the _sdk groups selected, go to Create>Quick Select Sets, and call it 'finger_sdk_set'. This will let us come back and select the _sdk nodes if need be. With the _sdk nodes still selected, go to Key>Set Driven Key>Set. This should bring the selected groups into the Driven window. Select fingers_ctrl and hit Load Driver. The entire rig should be in default position and the finger_ctrl attributes should be at 0. Now, highlight Curl in the top-right box, all the _sdk_groups in the bottom-left box, Rotate Z in the bottom-right box and hit the Key button. Set the value of Curl to 10, use only the Rotate Z channel of the _sdk group nodes to curl the fingers and create a fist, and hit Key once more. Going between 0 and 10 now with the Curl attribute should curl the fingers. Set Curl to -10, select all the _sdk group nodes, and use Rotate Z to go in the opposite direction and hit Key once more. Let's move on to Scrunch next. In the top-right box of the SDK window, highlight Scrunch, and with the same settings (all the _sdk groups and Rotate Z highlighted), hit Key when everything is at 0. Then set the value of Scrunch to 10, and use only the Rotate Z channel to create a pose of someone scraping their fingers against a blackboard. Hit Key when you are happy, and do the opposite at -10. Using this method, create poses for the remaining attributes on fingers_ctrl. You'll find that sometimes, you'll need to use a different Rotate attribute. For example, for the Spread attributes we have used Rotate Y.

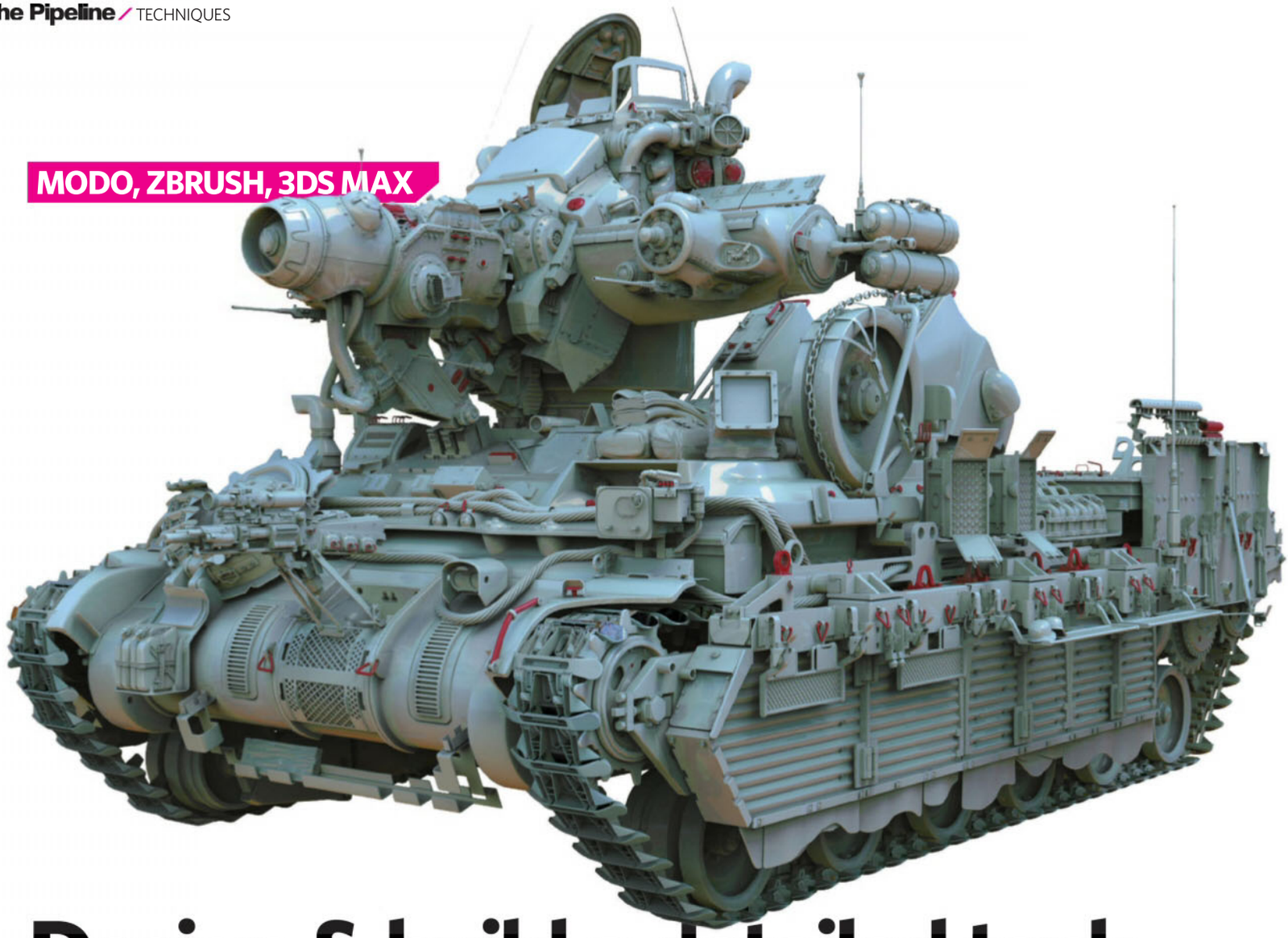
11 Finalise the rig Start by adding a new attribute to fklk_vis_switch_ctrl and then call it 'ikFingers_vis'. Give it a Min of 0 and a Max of 1. Then use Set Driven Keys and use this new attribute to drive the Visibility on fingers_ik_ctrl_grp. This should help keep the viewport a little cleaner. In the Outliner now, select all the finger control groups and hit Cmd/Ctrl+G. Rename this group 'fingers_ctrl_grp'. Then take all the groups holding the finger joints, group them together and call this group 'fingers_rig_grp'. Take both of these groups and parent them under global_SRT_ctrl. Next, create one more control that will let you translate the entire arm in either FK or IK mode. In the Top view, just use the CV Curve Tool to create an arrow shape (or a shape of your choice). Then name this shape 'arm_main_ctrl' and hit Cmd/Ctrl+G twice to create two group nodes above the new control. Rename the two group nodes appropriately with the _sdk and _offset suffixes. Now take the _offset node, hold down the V key on the keyboard (for point snapping) and snap the control to wrist_bind_jnt. If you cannot select the control easily as it is penetrating the mesh, edit its shape in Component mode. Parent the following groups under arm_main_ctrl: arm_fk_ctrl_grp and arm_ik_grp. The latter group should be housing elbow_ik_ctrl_offset, arm_ik_ctrl_offset and arm_root_ik_ctrl_offset. Then take arm_main_ctrl_offset and parent it under global_SRT_ctrl. Test the arm to see if it all works correctly, and if so, go in and pop all the relevant parts into the relevant Display Layers. 'Lock and Hide' any attributes you do not want the animator to key, and hide anything important (such as the IK handles) to finish the rig. The rig should now be complete and you can now skin the geometry to the joints.







MODO, ZBRUSH, 3DS MAX



Design & build a detailed tank

In this tutorial we will go over some of the most important, useful techniques for designing a new tank from scratch. This tutorial is meant for artists with some advanced knowledge about shape and design. We won't cover modelling skills and tricks, as that's something you can learn on your own in other tutorials.

The goal of this tutorial is to give people an overall view of how to tackle a big piece like this without getting lost in the overall view of the vehicle. Next to that you will see us using some dioramas for reference.

Anybody can go to a store and buy a vehicle assembly box, but making it stand out is something different, so keep an eye on such a piece. These model kits are also very handy for reading references from as they put a lot of effort in making these look as close as possible to the original designs, plus you can look at any part from any direction you want. We hope that by the end of this guide you, as a reader, will search more widely for reference, because at the end of it all, that's the part of the process that makes your design interesting, functional and believable. We tend to use the same websites for reference: primeportal.net and home.comcast.net/bzee1b/home.html.

For this tutorial we used 3ds Max for the high poly, together with ZBrush and MODO for the low poly (we switched to this one for the Booleans and unwrapping tools). The model itself is rendered in 3ds Max.

01 Gather references The most important step of the whole process is gathering and using references. For this tank we just started searching for two tanks that have some uniqueness to them. We went for two extreme versions: a WW2 British tank and a modern Iranian tank – the Sherman and the Nagmachon tank. It's important to pinpoint what makes these designs interesting. For the Nagmachon it's the side protection and the blocky feeling, while for the Sherman it's the feeling of height the tank gives you combined with the the smooth shapes. A good thing to do next is to search for other designs/tanks that uses the same functions, design or silhouettes. For the Nagmachon we see that the tracks disappear into the same heavy protection, so we searched for something similar but with an older look like the Churchill tank. Next to that we used a lot of detailed parts from the Nakpadon. The nice thing about Sherman is that fact that there are a lot of different silhouette versions, so combining it is really easy. If you don't know Maschinen Kriegers, look it up. Maschinen Kriegers are great if you get how they work. The art style is all about smoothness and no cliché shapes. And that's something we try to do when we design the big shapes for the tank. Hard surface doesn't mean everything has to look hard – smooth shapes (with enough control) give your audience some more breathing room and more space to rest their eyes. There aren't many Maschinen Krieger models out there and that's good – that way you can use your own imagination for the designs.

YOUR FREE DOWNLOADS
from **filesilo.co.uk/3dartist**
- Tutorial screenshots
- Object files
- Video tutorial

02 Build parts and weld the seams

It's never a good thing to only go for one surface type, it's just not interesting. The nice thing about organic pieces like cloths and bags is the wide range of colours. In this case we went for some backpacks. Now, the tower may be the biggest eye catcher. The shape/design idea comes from the unique Lun-class Ekranoplan. We think that every tank should have a hatch so we start from the top, add wings, and combine Maschinen Kriegers shapes with original ideas from the Ekranoplan. To make it feel more dangerous we add side guns and rear guns. The machine guns are situated underneath the turbines so they would not end up in the turbines. Next to that we add a lot of pipes and exhaust pipes to give it that heavy industrial feeling. In the image you can see some key pieces we pay close attention to when designing the tower. Welding can add a lot of believability to your model, it's so much better than just shoving faces into each other. And if you look at tanks you can see how they are sand-casted. It's important to pay close attention to references and see how things are sand-casted, and try to mimic that.

03 Non-symmetrical designs

Building up the base of your vehicle with symmetry is a good thing, but you have to keep in mind where you will break up the symmetry afterwards. Another way of breaking it up is by adding more details to it, but they have to be details that make sense. For example we added some extra cables running over the complete model. When designing a vehicle, remember it doesn't have to work, it just has to look like it could work. If you look at the tower you believe this works, just because of all the exhaust pipes and caps. If this tower was completely flat nobody would have believed that it works. To make the overall shape more interesting we add more colours to the model, it's something that's used in real vehicles as well, but of course, with a purpose. Most of the time, pieces that crew members interact with are painted in a bright colour, mostly red, so we did something similar.

04 Add details and bevels

A lot of details can make your low poly so much easier. In this phase we just try to search for pieces that would take forever to make a low-poly bake out of them and try to fill up these areas with other details, like pipes, so that they form solid shapes. That way you only have to model the overall silhouette of all assembled details and bake it totally flat. For that extra believable touch to your mechanical masterpiece, add floaters to be placed against your model to fake details. To make them blend, it's good to scale them out a bit (with the Shift key and Scale X and Y) with a blue colour. You can do the same for little seams, you copy face out, bevel those out and put them against the model again so that they blend perfectly with the base model. Once we are happy, we will start adding props to the model, in this case add a lot of different petrol tanks and a jerry can and it's good to vary these to break up the repetition a lot more. We always make sure we have four different versions of the same props, that way it never feels like we are using the same props over and over again. On the Beetle you can see how four organic pieces break up the roof. We just bent and squeezed some of the rolled-up cloth to make it look interesting. This Beetle is also a good example of how hard-surface shapes can be smooth.

05 Tweak and try a low-poly pass

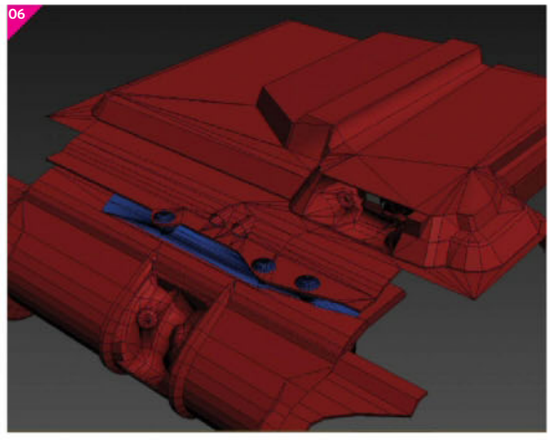
You probably want to add something extra to your model. In terms of decals, we always model and render them separately because decals in 3ds Max or KeyShot cast shadows, so you will want to cancel these out. This is something you won't have in MODO. At the end, paint some extra cast shadows to make sure they blend in correctly. Just don't forget that all the decals that are backfacing should be deleted, otherwise you will end up with strange results. Next it's always nice to tweak levels from your picture separately. Try to match the low-poly model as close as possible to the subdivision model. If you find some difficult parts, it's best to leave those for now and mark those with a different colour (red), so we won't forget them. Same for the pieces that we already have, those also have a different colour (green). The idea is simple, you search for these silhouettes and fill them up with more details so you can have a simple shape for low poly and for baking. When the easy parts are done we do another pass on the subdivision model with all the annoying/red parts of the model. We just add more additional details/shapes to the high poly so we can identify an easier and cheaper silhouette for the low poly. You will now want to preserve the illusion of depth without sacrificing too many triangles to get a decent and cheap bake. Let's take the guns as an example; there are a lot of details in there, so make sure that you are able to bake it into easy shapes. We could fill up some more holes (red pieces) to make this process even easier.

06 Check the wireframe and bake

A good way to have a straight style through your whole model is checking the wireframe thickness. You want to make sure that everything has basically the same thickness. The tricount should go hand in hand with the size of the model. In our image, the blue pieces show a thicker wireframe than all the rest, so this has to be reduced way more. Splines can be really expensive. A good idea is to wrap cables together, so the low-poly model can be one cable but a really thick one. That way you bake multiple cables by just using one mesh. For example: if you have five cables, take the middle one and add a shell modifier – this way you can have the more normal position for all of the cables. To make this method less noticeable, it's a good idea to add one more loose cable around the other ones to make it more believable. Adding different colours can enpower this effect. The nice thing about Max is the stack – it benefits you in that you never have to translate your editable splines directly to editable poly. Instead you should use an editable poly modifer, that way, when you come back to the low poly you can change the interpolation and the sides. This just spares a lot of time and makes tweaking so much easier. Make sure that you always check the 'Generate Mapping Coordinates' option.

07 Welding and exploding

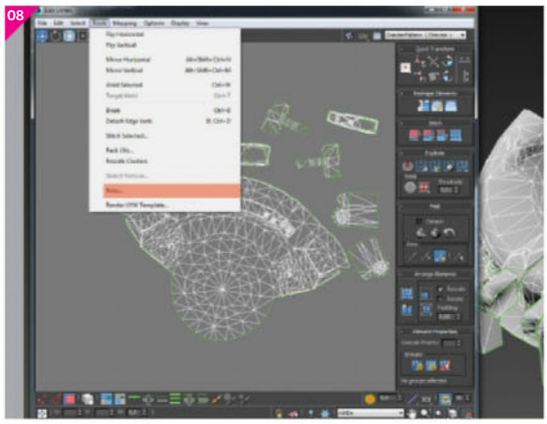
When we make a vehicle we try to weld everything together, so we don't end up with 50 elements – the less UVs the better. Welding shapes can sometimes can sometimes be a pain. To solve this you can use Booleans. We prefer using MODO's Booleans scene functions because they always work perfectly (as long as both meshes are completely closed). Welding all possible meshes together gives you better bakes. It takes more time but it gives you much nicer results and of course if makes it easier to work with afterwards. Be aware though: Booleans will always give you a dirty wireframe mesh with unnecessary vertices, but those you can easily target weld. The exploding process during baking can take up quite some time, and the only thing you can do is make small offsets, between the high poly and the low poly and you don't want that. So make sure that you just play safe from the start. Take your high poly and make an incremented save. Open it and explode your high-poly model completely. Make another incremented save of it. Open that one, and start optimising it completely. Now, when you are are done with the low poly, you only have to merge in the exploded high poly and you are ready to set up your cage and bake your model. This is so much easier then having to explode both the low-poly model and the high-poly model, and this way you are sure everything has a matching offset.

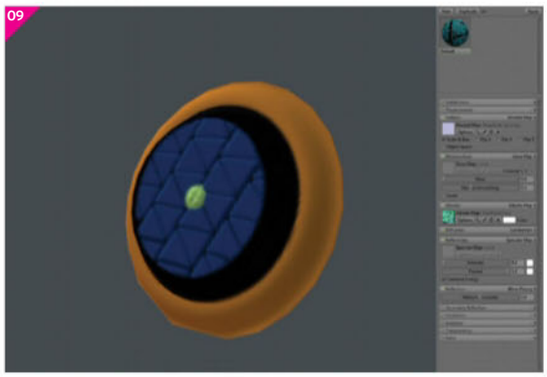


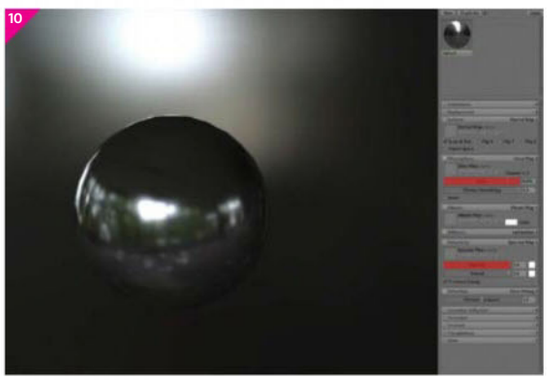
Blockouts versus details

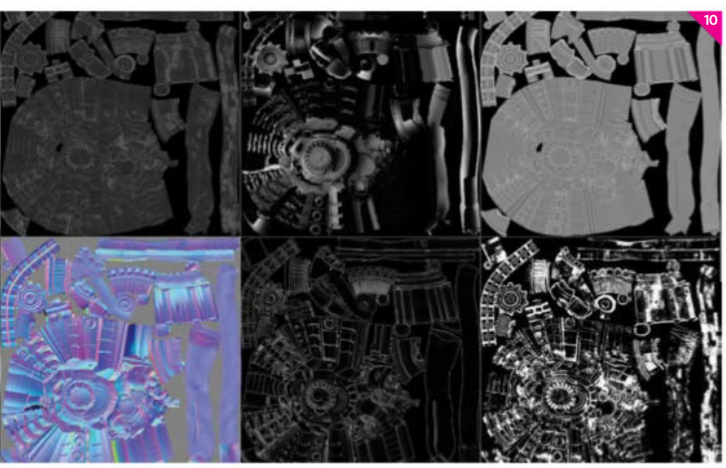
We always start working on a really interesting area of a vehicle/detailed part first – that way you're excited to keep working on it and you can figure out the style you're going for. We will make this as Alpha as possible and we then bring the design to the team, showing them our vision of the vehicle, instead of having to say: 'This is just a blockout, just imagine details being in there'. We don't add a lot of bolts and certainly no splines/cables at this point. That's something we do when we are completely done with everything.

All tutorial files can be downloaded from: **filesilo.co.uk/3dartist**









08 Unwrap and test render

We always start unwrapping pieces by testing out all kinds of projections – some of these provide such a nice result without having to do anything manually. It's also important to know that relaxing pieces is super handy. You should relax every piece of your unwrap. We recommend you use MODO unwrap as it has a lot of useable features – it shows overlapping faces in red, deformation scale in colours and it has useful projection tools (like barycentric and so on). And if you really want to be lazy you can just planar unwrap all sides separately (with left, right, top, bottom, back and front) relax, or use barycentric projection on those and then stitch them together. It can be useful to combine projections as well as using the stitching and relaxing tool. Let's take the reserve wheel of the tanks as an example, as it's a more 'complicated' shape. We'll start by doing test bakes. The resolution is really important here, because that's how you know how far you can push the details and how much will get transferred into the final Normal map. Never go crazy with details that won't be tranferred into the bakes. It's better to have a clean Normal map with readable details than an overdetailed bake that will just look way too noisy. When doing the test bakes, don't make the render setting/quality too high. We don't even bother setting up the correct smoothing groups for the model – we just want to get an overall view of what the bake will look like. Instead of doing a Normal map test bake, we bake Object space bakes, so see if the cage and the bake itself works. OBJ space maps don't take long to render. The body is 8K and rendering out the OBJ took 30 seconds so it was easy to try different things out. In the top-left image you can see a standard OBJ map from a vehicle.

09 Bleeding masks and padding

Rendering out masks are super important for big objects/vehicles. You assign colours/materials to the subdivision material for every material that you have in that vehicle, that way it's easier to select pieces and paint them in. But this is something that could be difficult with the blended edges. If the edges blend between two colours it will create a separate colour in between, and that's never a good thing. That's something you don't have in Max. MODO is really precise for this, it never gives you colour bleeding. But if you want to use Max, it's important that you use a a very wide colour palette with a lot of contrast between all the colours. Padding is something that's really noticeable, but what is it? Well, we bake certain pixels further then the actual UV border, and that's good. Otherwise you would sometimes see small seams in your model. It won't hurt to add padding to all baked maps too, and this is certainly the case for masks, Normal Map and AO. In the images on the left you will see some extreme padding, but notice that it stops when it hits another colour.

10 Texture and style the model

What could be really handy for people that don't have a lot of experience with spec is to just start with an Albedo map. Then load that map in Marmoset and just play with the slider of the spec or gloss input until you're happy with the result. Read off the value that fits with those sliders. For example: if the slider says 30 per cent, then you just divide 255 by 3 and then you'll know the colour value. This is a really good way for people who have problems with material definition. We render a lot of extra maps out for this model: some curvatures, light maps, global illumination, dirt and scratch maps for example. All of these are of course based on the high-poly model. Then we just made some texture styles. This way we got our own texture libary without having to switch to dDo to get some presets. From that point onwards we can easily texture models. Afterwards we tweak the mask and add colour variation. Make sure the texture's not too noisy by using a base colour followed by just one to three layers of weather effects. In most cases just one main and one secondary, with slight hue shifts, and a third/fourth for decals will do.

Kitbashing

It's really handy to have some sort of kitbash kit with you, and you can get one by modelling useful pieces. Remember that the parts just have to look like it could work. Random machinery also helps speed up the process – it's good to add those in places where your models lacks detail. We may also find interesting shapes on the internet that we want in there. These pieces should not be too noisy. Vehicles are almost always made out of the same material, so make sure these pieces are the same material.

BLENDER

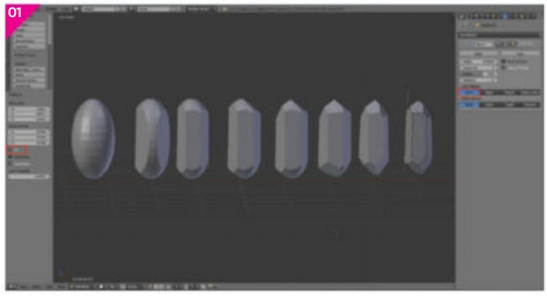
Model and texture crystals in Blender

When creating the crystal turtle project, we knew that the crystals on its back would be the centrepiece of the image, so creating a realistic glowing crystal was essential to the success of this project. In this tutorial we will guide you through the steps it took to creating these crystals.

As with any 3D asset, the first step is modelling. We'll start by taking a look at how to use the Bisect tool to transform a sphere into a crystal model in just a few clicks. However, modelling won't be the main focus of this tutorial. What really makes these crystals convincing is how the material is set up, which will be the real meat of this tutorial.

We'll begin by covering the node setup and looking at the crystal's surface shader. By combining different coloured glass shaders, we can simulate how a prism splits light. Then we'll move on to volumetrics, which is split into three different steps. The first step is to give the crystal a vertical gradient, so that it's opaque towards the bottom and translucent towards the top. The next step is to add some speckled details using procedural textures. The last step is to use a 2D image texture and transform it into a 3D volumetric texture for even more detail on the insides of the crystals. Lastly we'll discuss how we did the surface displacement to add yet another level of realism.

01 Model the crystals We modelled the crystals using the Bisect tool, which cuts planar faces off the side of a model. By default, there is no shortcut hotkey for this tool, but you can create one or search for 'Bisect' in the spacebar search menu. Starting from a UV sphere, use BIsect to cut away faces from the object until there are no curved surfaces left. In Edit mode select everything, search for Bisect, then click and drag a line through your object. Anything outside of that line will be cut away. Make sure to check Fill in the tool panel so that the cut-away plane gets filled in. If you find that BIsect is removing parts you want to keep, drag the line in the opposite direction and it will remove the other side instead. If it doesn't seem to be working, apply rotation and scale in Object mode.



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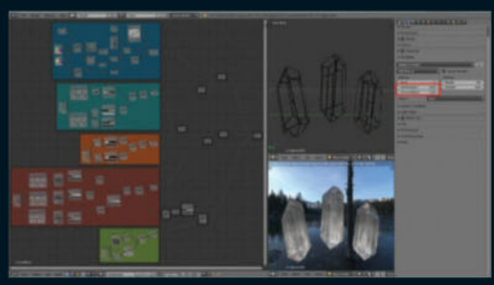
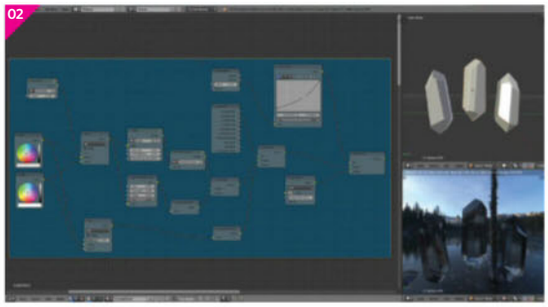


More glow and reducing noise

In our case, the glow we added with the volumetrics wasn't enough. You can add more glow by adding a lamp inside the crystal but this can introduce a lot of noise to our renders. To reduce the noise without having to increase the number of samples, locate the Sampling panel in the Render options, change Clamp Direct to a value of 4, and Clamp Indirect to a value of 1.

02



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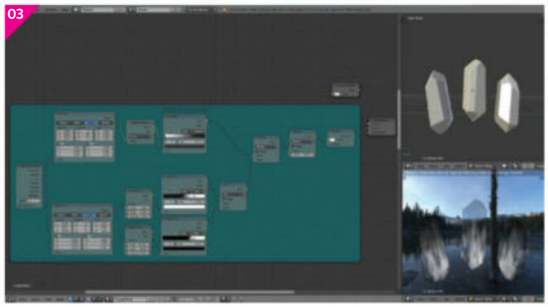

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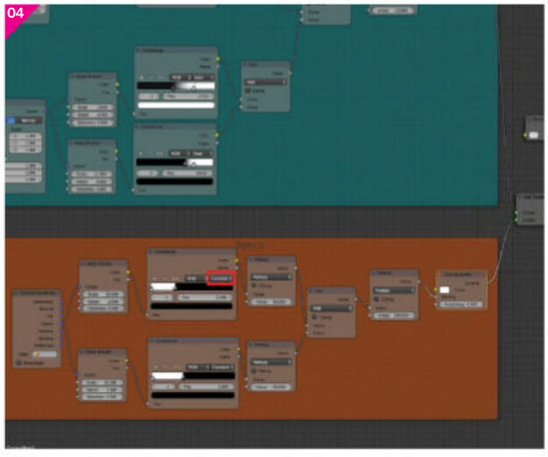
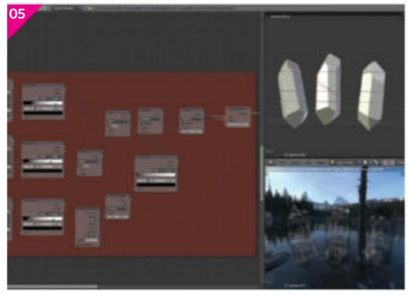


02 Surface material The key to this part of the shader is light dispersion. We want our crystals to split light like a prism does. To do this, add three glass shaders: one completely red, one completely green and one completely blue. Give each of these nodes a slightly different IOR value so that it bends light a little differently. Combine the different coloured glasses with two Add Shader nodes for a white glass that splits colours like a prism. You'll see that we've merged this set of nodes into a single group called 'Glass' in our node setup. You'll also see that our node setup replaces shadow rays with transparency. This isn't physically accurate, but we do this because we don't want the shell of the crystal casting a shadow on the inner volumetric details that we'll be adding later. Not only does this speed up render times and reduce noise, but it also helps make the details easier to see. Also note: whenever working on a shader that reflects or refracts light, it's always a good idea to use an environment HDRI.

03 Volumetric vertical gradient When looking at references, we noticed a lot of crystals were more opaque towards the bottom and more transparent towards the top. We can reproduce this look with volumetric textures. Using generated texture coordinates, add a Gradient Texture node. Then modify its direction and falloff using a ColorRamp node. You can hook this up to the Strength socket of an Emission node, and add that to the Volume socket of our material output. This looks a bit too uniform, so add some Noise Texture nodes and multiply their output with the gradient texture. When working on the volumetrics replace our Glass Shader node setup with a simple temporary transparent shader for faster render times.

05



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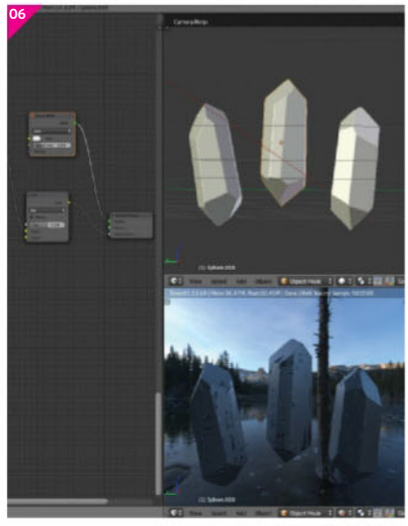
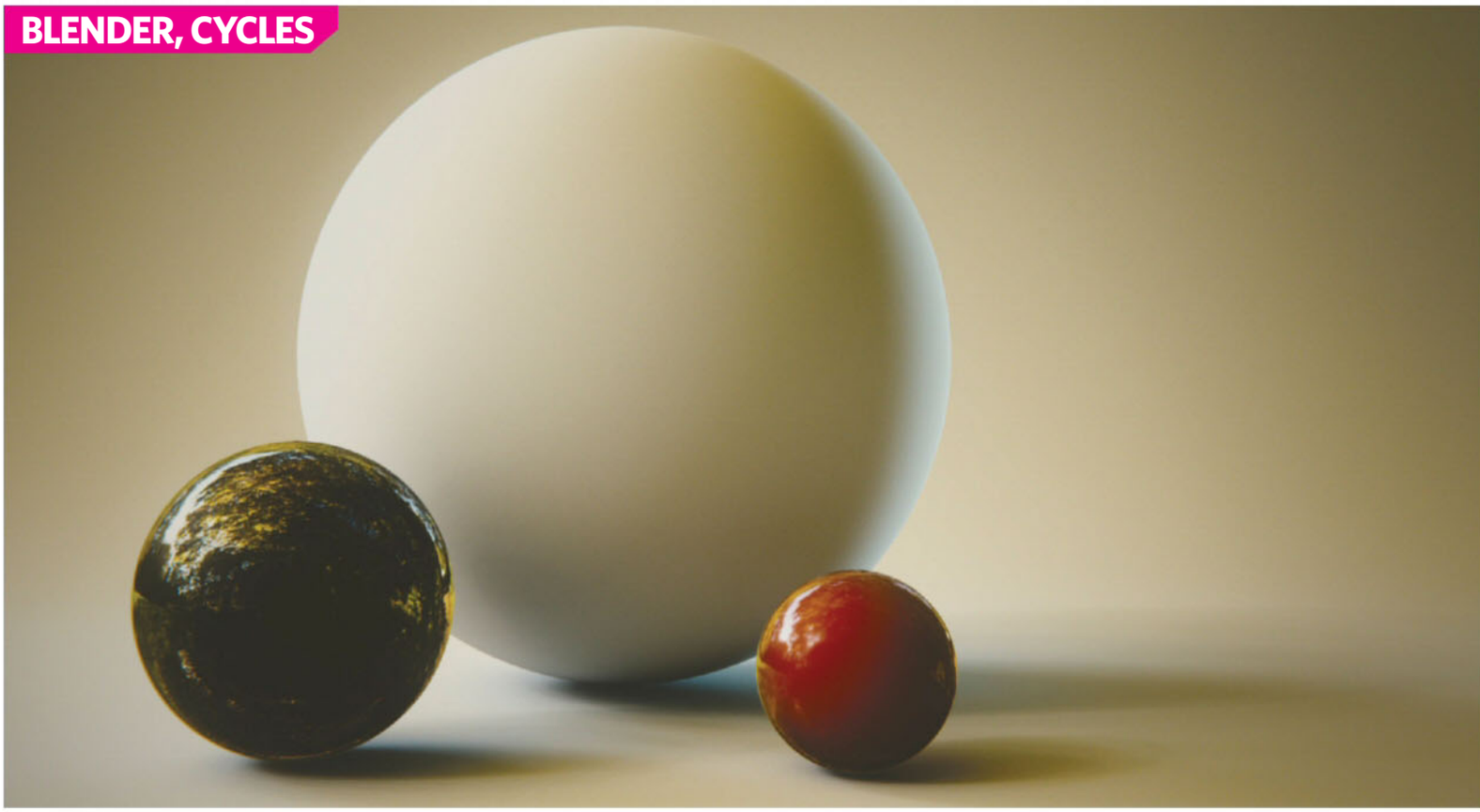


04 Volumetric specs We can add some irregularity and visual interest to our crystals with more noise texture nodes. Add a Noise Texture node and run it through a ColorRamp node with a Constant falloff for a hard edge. For more variety, we duplicated the Noise Texture and ColorRamp nodes and gave the second set a slightly different scale and ColorRamp falloff. After combining these two noise textures with the Add node, plug this output into the Density socket of a Volume Scatter node. This can be combined with our vertical gradient using the Add Shader.

05 Volumetric image texture This is the final layer of detail for our volumetrics. Since there aren't many options for procedural textures in cycles, we tried using a grunge image texture. As our image is only 2D and we want to map it to a 3D volumetric space, we split up the texture coordinate into three different vector mapping nodes – each with a 90-degree rotation along a different axis. Then the transformed texture coordinate is plugged into our image texture, and combined back together with the Add node. We can multiply the output of our textures with a Voroni texture to break up uniformity from our input image. Plug the output of this into a Volume Scatter node and combine it with the other volumetrics using Add Shader.

06 Surface displacement The last step in making these crystals look realistic is to add some surface detail. Here we can just use the generated texture coordinates with a grunge image texture and a noise texture, then combine the two with a colour-mixing node. When experimenting, we found we could combine this Bump map with the volumetric image textures from before – giving us an even better-looking output. While working on the surface displacement; it's a good idea to use a simple glossy shader for the material surface. This should make it easier to see the surface details you're working on.

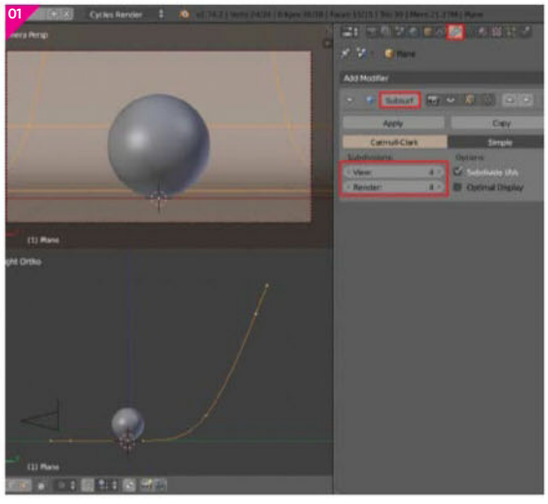
BLENDER, CYCLES



Set up a lighting rig in Blender

Lighting, in its broadest sense, can make or break a scene – it is often one of the most overlooked aspects of 3D and will dictate how believable and captivating your scene will be. And this is also one of the primary reasons why some artists will dedicate their 3D career to understanding and deconstructing it. And with the advent of the Cycles rendering engine for Blender, lighting has never been so fun and intuitive. With that said, there are a few basic principles and rules to follow to create and complement convincing imagery, which will also give you more room to break these and experiment. The question of what type of lighting is best comes up often. As much as we would like to give a definitive answer to this, it all depends on what scene you currently have and what emotion you are trying to portray. It also goes hand in hand with the other aspects of your scene and should, in most cases, exaggerate and give more meaning to them. A very rudimentary example of this is when you have gone all the way in creating a very detailed model that has very convincing and realistic textures applied to it; however, during the lighting stage, you decided not to give much emphasis to it and just dropped in a few lamps here and there. After a while, you realise your scene isn't looking as good as you had hoped it would be, despite your efforts of adding all the necessary modelling and texturing details. Disappointed, you decide to abandon the project and swear to never finish it. In this brief guide, we'll touch on the fundamentals of lighting and how you can incorporate them into your scene and avoid caveats that may demotivate you.

01 Basic scene setup For this guide, we will be utilising a very basic scene setup: a sphere and a backdrop. This is most useful when gauging your lighting scheme and will serve as a great reference later on when attempting larger and more complex scenes. Add a UV Sphere with the default settings, add a Subsurf Modifier level 2, and set the shading to Smooth. For the backdrop, add a Plane with a Subsurf Modifier level 3, then extrude the back part, as seen in the image below. Next, place your camera in front of the sphere so you can clearly visualise the whole scene.



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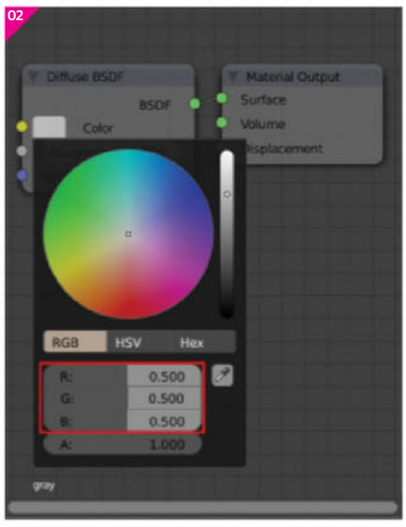
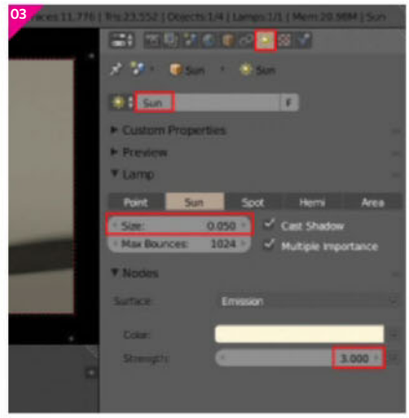
02 Material and shader setup In the meantime, we won't be using any fancy materials and textures, just so you can clearly absorb the idea and not get distracted by other prevailing elements. Add a grey (RGB = 0.5) Diffuse material to the sphere and backdrop. You can either use the Properties Editor or the Material Node Editor when adding materials to an object, the latter providing you with more control over the nodes as needed. At this point, make sure you have the Cycles render selected as the scene's renderer.

03 Key lighting setup In the following steps, we'll gradually build a lighting setup that is most commonly used in photography studios and product visualisations. The key light serves as the primary source of light in your scene. Its purposes include (but are not limited to) the following: highlighting/emphasising the main subject, providing the initial shape and adding the main shadow. Add a Sun Lamp, position it at an approximately 45-degree angle (Top View and Front View). Reduce the size to create sharper shadows and use a relatively higher lamp strength than the default value.

04 Fill lighting setup The fill light is used to add illumination to the unlit portions of your subject and to even out the shading. Usually, in photography studios, they use a softbox – a type of modifier that scatters and softens the light shot from a strobe or flash. In most 3D applications, we can replicate this by creating an object that will emit light. In Blender, add a Plane, position it adjacent to the Sun Lamp but on the opposite side of the sphere, scale it to a relatively large size, and add an Emission shader to it, increasing the strength as needed. You'll now notice that it killed the dark shading that we previously had, as well as adding a soft shadow opposite the emitter's location.

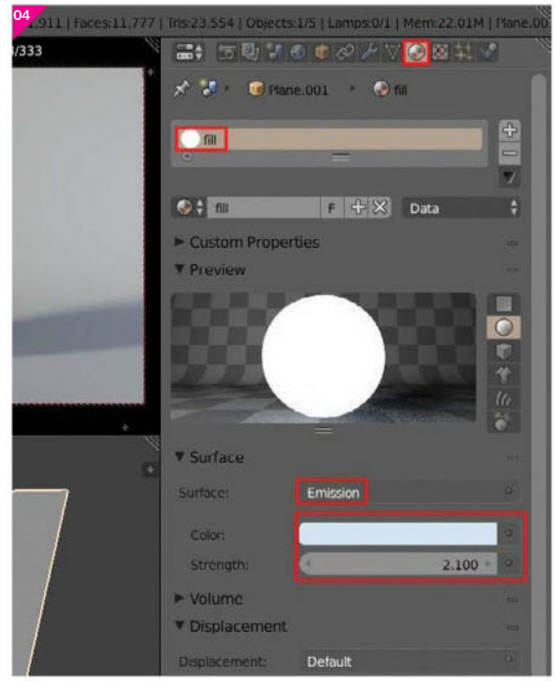


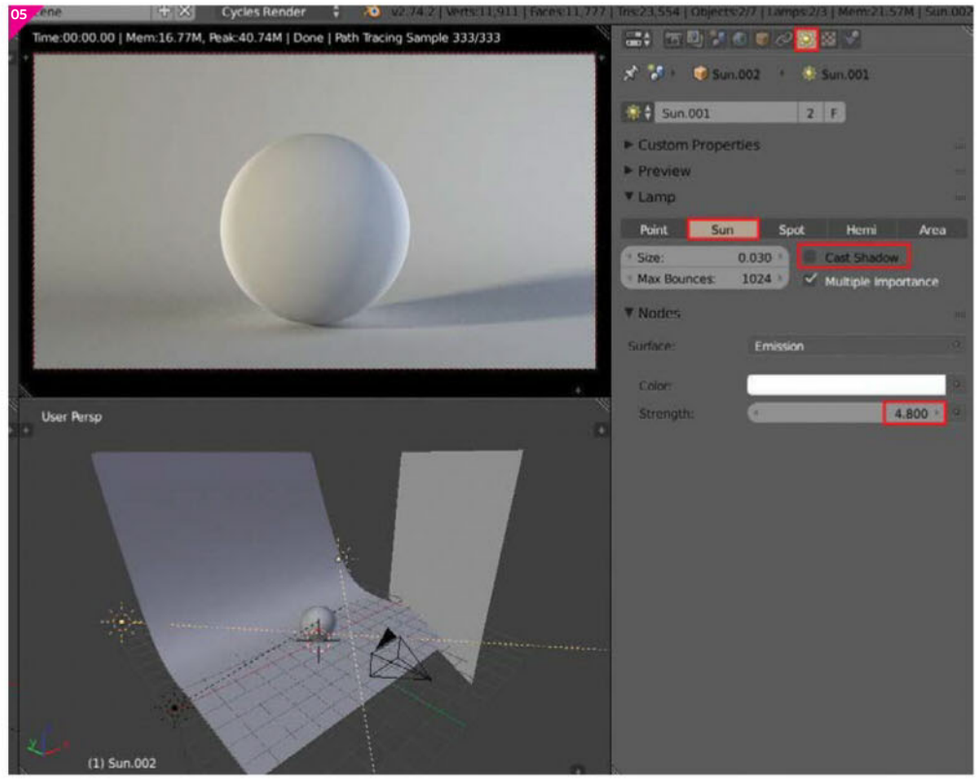
05 Back lighting setup As you may have already noticed, this completes the three-point lighting setup. This type of lighting is a cliché to artists, however, it serves its purpose well and lives up to its reputation too. Used sparingly, these lights will give life to your scenes that you would never have achieved otherwise. The back light, or rim light, is used to add definition to the overall shape and silhouette of the subject. When used on character portraits, it creates this wonderful scattering effect that is most noticeable on the hair strands and on skin. Add a Sun Lamp in Blender, position it opposite the key Light or the fill Light, and adjust the strength accordingly. Depending on your scene setup, you also may want to create another back light to compensate the other side of your model, as well as disabling the shadows being cast from these light sources.

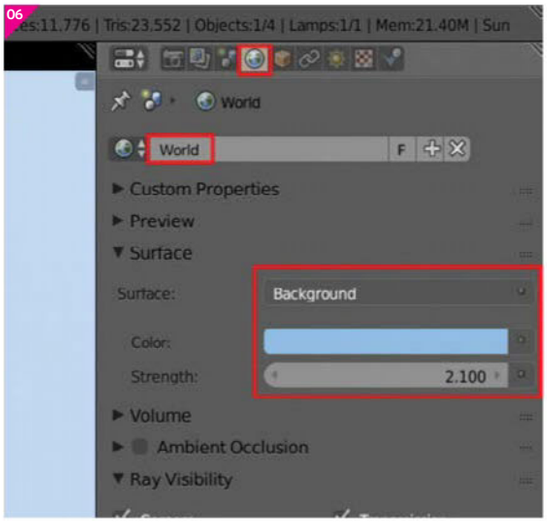


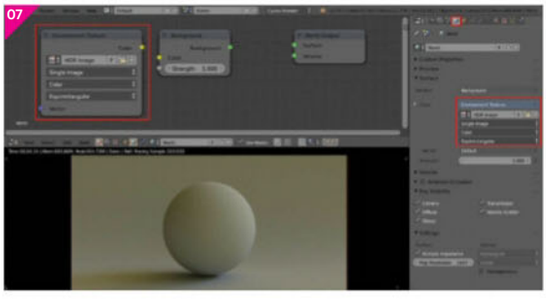
Lamp size matters

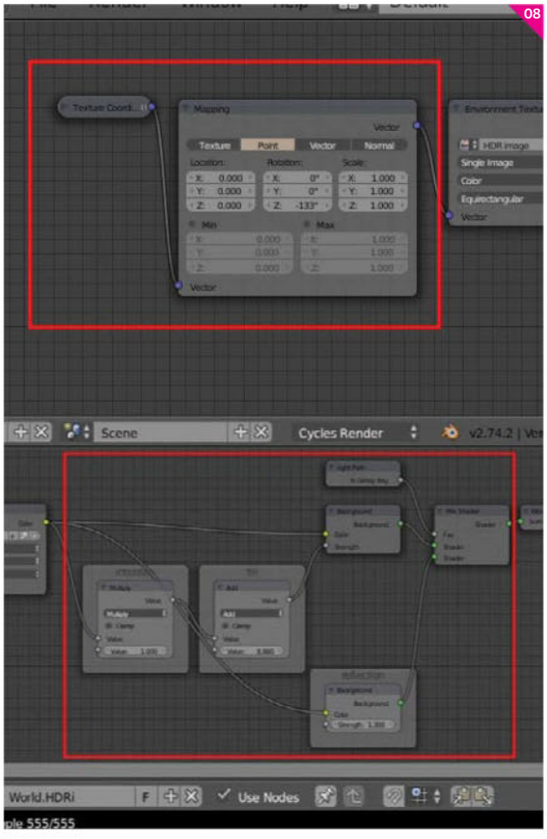
As with real life and in physics, the size of your light source dictates how sharp or soft your shadows are. The smaller your light source, the sharper and more defined your shadows will be. The larger your light source, the softer and more distributed your shadows will be. Keep this in mind when adding mood and adding drama to your scenes.

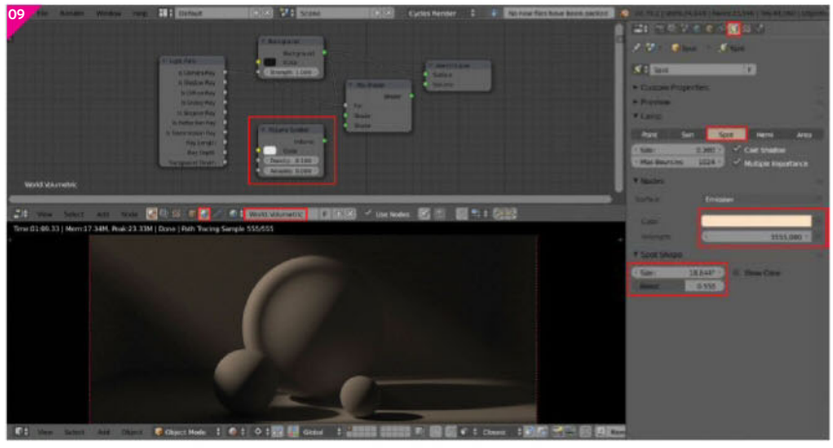


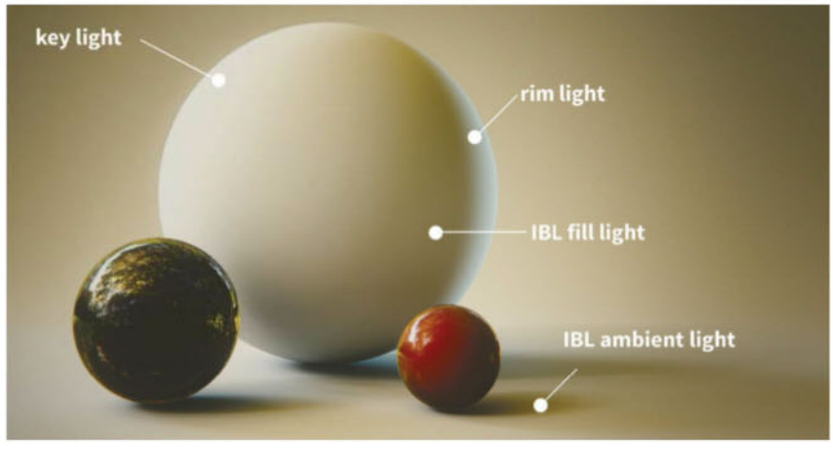












06 Ambient lighting setup The primary purpose of ambient light is to simulate the illumination that we receive from the sky, for example, on a cloudy and overcast day. When used alongside a CG and live action composite, this can help blend the CG scene seamlessly with real-life footage. Blender doesn't have an explicit way of achieving GI (global illumination), but by adjusting the World's settings, the results are almost convincingly similar. You can use this technique in conjunction with the key light method, but a better option is available on the next step.

07 Image-based lighting (IBL) One of the reasons we use HDRIs is because they have a higher bit-depth and can store additional lighting information that can dictate how your scene will be illuminated based on the image's light intensity values. This technique is often used by animation studios worldwide to give more life to their scenes as well as seamlessly blend several elements together (ie by shooting a panoramic HDR of the set). In Blender, you can do this by adding an Environment Texture and adjusting the strength accordingly.

08 Image-based lighting controller With the setup as seen in Step 7, we can further control how the lighting behaves by adding a couple of nodes in Blender that will enable us to rotate the environment texture, control the light intensity, control the light fill and adjust how much reflection it casts on reflective materials and objects. For the purposes of illustration, we've added two reflective (metal and dielectric) objects. However, there are still a lot of possibilities with IBL in Blender and we are only touching the surface with this tutorial.

09 Volumetric lighting setup And to conclude this brief overview to lighting, we'll introduce you to one of Blender and Cycles' new features. Volumetric lighting simulates situations which include fog, god rays, dust particles and the like. To achieve this in Blender, simply attach a Volume Scatter node into the World Output node's Volume Input, using a Spot Lamp as the primary source of light. By default, volumetric rendering in Blender is relatively slow, however, there are a few tricks to work around this with little or no detriment to quality.

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Chillblast Fusion Projection 3

A capable and affordable desktop 3D workstation that marks a good starting point for 3D work

There are plenty of reasons to buy a custom-built workstation from a reliable, well-established independent UK vendor. As we've seen recently with workstations from Overclockers and Scan Computers, you'll get great rendering performance from a 3D system put together and overclocked by hardware enthusiasts, made from some of the best performing components on the market.

Chillblast is the latest such vendor to join this elite list with a desktop workstation called the Fusion Projection 3, that fits within a relatively modest budget.

It has managed this by slightly cutting a few areas to shave a good few hundred pounds from the price, and that's without seriously compromising performance.

For example, in the default configuration at least, you get a heavily overclocked Intel Core i5 processor rather than a Core i7. The big technical difference between them is hyper-threading in the Core i7, so Windows sees a quad-core chip as eight logical cores. It's still only quad-core at its heart though, so in many tasks it won't perform any differently to a Core i5.

The other difference is slightly higher clock speeds, but since the Core i5-4690K has been overclocked from 3.5GHz to 4.2GHz, this isn't really a factor.

With it is an Nvidia Quadro K2200, a workhorse mid-range GPU, that's a no-brainer for an affordable but capable 3D workstation such as this.

There's also 16GB of DDR3 memory, an ASUS Z79-K motherboard, a 128GB Samsung SSD and a 1TB hard disk, all put together in a very sleek and roomy Fractal Design Define R5 chassis and powered by a 600W Corsair power supply. The build quality is top-notch too, with a great job done on cable management and internal design.

Sure, if you were hoping to produce something with more detail than the average Pixar movie, you might require more heavy-duty hardware, but this specification (and price) is just right for students, 3D beginners or anyone looking to test the water with 3D animation.

The SSD is a high-performance Samsung SM951 PCI-Express model, slotted into the motherboard's M2 slot. It runs a heck of a lot faster than a typical SATA SSD, with impressive read speeds of 725 MB/sec and write speeds of 646 MB/sec.

ABOVE The black Fractal Design Define R5 is a decent case with a sleek design

We can't complain about the speed, but 128GB is a paltry size these days. Luckily though, a boost to 256GB only costs £50 extra on the customisation page.

In our tests the CPU benchmarks look excellent for a workstation costing £1,279, while the GPU results are in line with other workstations that use a Quadro K2200.

In CINEBENCH it scored 651, a figure that's lower than it would be if the CPU supported hyper-threading, but only by a slim margin. In 3ds Max the 1080p demo scene took 15 minutes 43 seconds to render, it's not at all bad and closely matches the pricier quad-core Xeon E5 chips we've seen, and indicating performance that's well suited for rendering tasks of average complexity.

How does it compare to other similar 3D systems? HP's £2,700 Z440 uses the same GPU, but offers better CPU performance, with a quad-core hyper-threaded Xeon E5-1630 v3, 16GB

ABOVE An Akasa Nero 3 is an efficient but inexpensive air cooler, and keeps the Fusion Projection 3 running almost silent whilst in use

> The build quality is top-notch too, with a great job done on cable management and internal design

ABOVE Replacing the side panel was slightly fiddly after we'd finished poking around inside

BELOW The cable management and internals are all kept tidy and well presented

ABOVE The mid-range Quadro K2200 is great for this affordable workstation

Essential info

Price	£1,279 (inc VAT)
Website	chillblast.com
CPU	Intel Core i5-4690K (clocked to 4.2 GHz)
RAM	16GB DDR3
SSD	128GB Samsung SM951 PCI Express
GPU	Nvidia Quadro K2200
HDD	1TB

Summary

★★★★☆ **Features**
★★★★☆ **Performance**
★★★★☆ **Design**
★★★★★ **Value for money**

Verdict ★★★★☆

Great value and a well-planned configuration means the Fusion Projection 3 will work well for small-to-medium sized projects

of ECC DDR4 memory and an X99 motherboard rather than a Core i5.

The Fusion Projection 3's CPU benchmark result is slightly lower, but has a higher GPU result of 122.6FPS. In SPECviewperf, results are slightly ahead with 47.2 in the catia-04 section, eight points ahead. Most importantly, it does all of this at half the cost.

There's also a typical choice of storage, graphics and processor upgrades that are all available from the company's website should you need more performance. Although currently, the only available GPU upgrade is a Quadro K4000 rather than Nvidia's newer K4200, and no AMD cards are offered to us here. The lack of GPU variety here is a slight Achilles heel in what is otherwise a strong offering indeed, especially since the Fusion Projection 3 comes with a decent five-year warranty and two-year collect and return.

Orestis Bastounis

Wacom Cintiq 27QHD

We test the best of the best with Wacom's most high-end tablet

As far as graphics tablets go, Wacom's newly introduced Cintiq 27QHD is definitely the peak. For one, it looks fantastic – it's almost impossible to be in the same room as this piece of tech without feeling a compulsive need to try it.

This is in part due to how impressively crisp every artistic detail looks on screen. The 27QHD offers the highest resolution of any Cintiq at 2560 x 1440: a widescreen 16:9 with four times the pixel density as a standard HDTV. Colour management has definitely not been forgotten either. The 27QHD features 97% Adobe RGB, 1.07 billion colours and Rec. 709 for colour-sensitive workflows. Colour calibration can be improved upon even more with the separately sold Wacom Color Manager, with calibration so precise that there's no need for a separate reference monitor. Despite having used it with Sculptris, Rebelle and Photoshop over several hours, the Cintiq 27QHD also stayed cool, and the antiglare on the screen worked very well.

Any users familiar with Wacom's older Cintiqs will also be pleased with the gadgets that come with the 27QHD. The Cintiq 27QHD Pro Pen boasts 2,048 levels of pressure sensitivity with a 40-degree pen tilt recognition that Wacom users expect. Along with this, it features a pressure-sensitive eraser that works like a normal pencil's eraser at the back, and two side switches that can be customised for common commands, such as the middle-mouse click and right-click that are useful when working in 3D software.

The handiest gadget that comes with the 27QHD for 3D artists, however, is probably the new ExpressKey Remote. A replacement for the ExpressKey buttons on the old display borders, the remote enables stress-free access to favourite shortcuts as well as zooming, rotation or tool-changing functionalities.

Best of all, the ExpressKey remote actually has a magnetic back so a user can place it wherever it's most comfortable on the screen borders while working, making it much harder to lose. For an extra $500 (£316), artists can buy the 27QHD with touch functionality, which lets users work both remotely and hands-on with iPad-like multitouch gestures to zoom and rotate in the display.

The 27-inch display is enormous and fairly heavy at 9kg on its own (and 25.1kg with the optional Wacom ergonomic stand), so it does require a lot of desk space, and it's not so easy to reach around for access to the keyboard or mouse. As a tablet needed only for sculpting or sketching out concepts from time to time, then, it might not be the best choice – especially as it costs a whopping $2,299.99 (£1,799.99) and that's without the added price of the multitouch version. If needed as a nonportable, permanent addition to a workflow and workstation, though, the 27QHD is worth it.

Set-up time takes minutes due to the range of adaptors and cables included in the box and once it's properly in use, it is really exciting to feel the pen work smoothly on the glass display, and to have so much screen real-estate to draw and sculpt on as well. If using a tool as interactive as a pen within software like ZBrush sounds like heaven, the Wacom Cintiq 27QHD is a graphics tablet that's very hard to beat.

Larissa Mori

ABOVE The edgeless glass display can go from a five-degree slope to a 20-degree one using in-built foldout legs, so working on it is very comfortable

BELOW Due to the range of cables included, it only takes minutes to set a Wacom Cintiq 27QHD up

RIGHT The new ExpressKey Remote means you don't have to worry about accidentally pressing any buttons again

BELOW The Cintiq works with a variety of configurations including with another Cintiq, an Intuos pen tablet, or a pre-existing mouse

"The 27QHD offers the highest resolution of any Cintiq at 2560 x 1440: a widescreen 16:9 with four times the pixel density of HDTV"

LEFT The Cintiq 27QHD Touch Pro Pen features Wacom's proprietary Tip Sensor technology, which offers users near-zero (one gram) starting pressure

Essential info

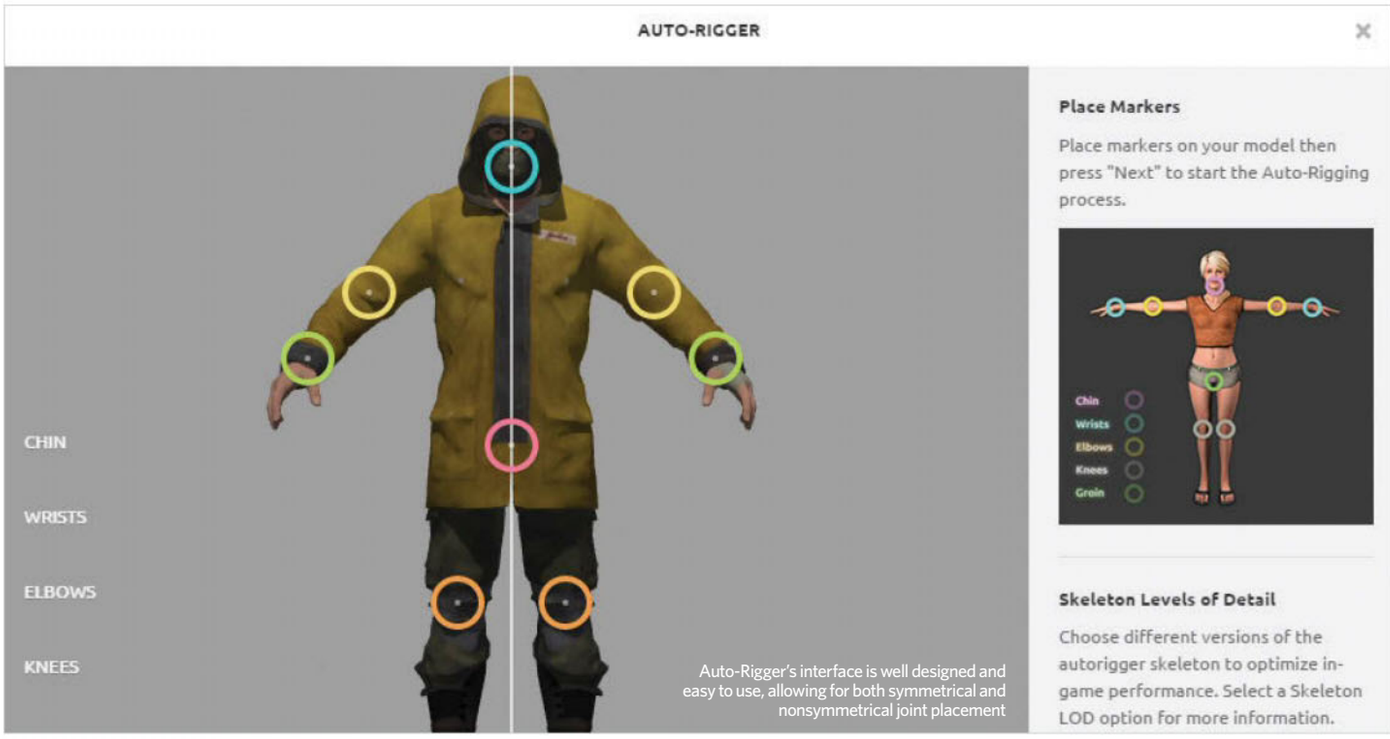
Price	£1,799.99 / $2,299.99
Website	wacom.com
System requirements	Windows 7 (32- and 64-bit) and 8 / Mac OS X 10.8 and up
Cables included	DisplayPort, HDMI, USB 3.0, Micro USB (ExpressKey Remote)
Adaptors included	DVI-D TO HDMI, Mini DisplayPort to DisplayPort
Size	770 x 465 x 54.5 mm / 30.3 x 18.3 x 2.1 in
Response rate	12ms

Summary

- ★★★★☆ **Features**
- ★★★★☆ **Performance**
- ★★★★★ **Design**
- ★★★☆☆ **Value for money**

Verdict ★★★★☆

The Cintiq 27QHD is today's ultimate creative tablet – just be sure to have the desk space for it



Auto-Rigger's interface is well designed and easy to use, allowing for both symmetrical and nonsymmetrical joint placement

Mixamo 2.0

We take a look at Mixamo, the latest software that Adobe intends to put into the cloud

With the news that Adobe had acquired Mixamo at the beginning of June we were eager to see exactly what Mixamo could do. Rather than just a stand-alone software, Mixamo provides an online service to create, rig and animate game-ready characters, allowing you to then export the rigged mesh and any animations purchased for use in Unity 5, Unreal Engine 4 or any other engine that supports FBX or COLLADA files.

Having several low-poly meshes to hand we were instantly drawn to the Auto-Rigger feature, which accepts both OBJ and FBX files along with any associated materials. Once uploaded, the interface is clear and easy to understand; bone placement being handled by five markers, for chin, wrist, elbow, knee and groin. The documentation suggests a T-pose, but we were pleasantly surprised that it coped well with the A-pose that we loaded into the software – even the fingers were of an acceptable standard.

There were skinning issues with the long coat and hood on the mesh, although these were expected, hence their inclusion. The viewer gives you a basic idle animation to check that you are happy with the results, enabling you to go back to the joint placement step of the process and adjust it if it's necessary.

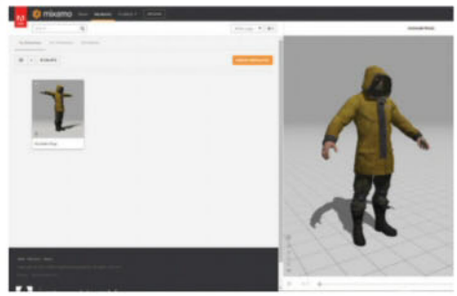
Once processed the mesh is stored in your account for later retrieval or editing. The feature that we feel may be missing the most in the process is the lack of an ability to tweak the skinning of the mesh by hand, a few bespoke adjustments would have made for a far better final result, but this can be accomplished after downloading them in a 3D software of your choice. It's not a dealbreaker, but it is certainly something that would enhance the Mixamo toolset.

Mixamo has an extensive animation library for you to apply to your newly created rig. We were able to browse over 2,200 character animations, preview them on our mesh, and alter parameters such as pacing and arm width before saving them to an account ready for download. As we gather it, the free version currently available allows for ten autorigged character downloads and 20 free animation downloads – it's not enough to populate a game, but more than sufficient for any character artist to get some excellent presentation material for the portfolio.

In addition to the Auto-Rigger, Mixamo comes with Fuse, an out-of-the-box character customisation application which enables you to generate characters from a set of clothing assets and anatomy types/genders. Also in the package is an online LOD generator called Decimator Preview, however at the time of writing this, due to the acquisition by Adobe it is only available to existing Indie and All Access customers.

Seth Nash

BELOW All of your uploaded meshes are stored in a single online repository for further adjustment and can be downloaded whenever you need them



Essential info

Price	Currently free, with limited access
Website	mixamo.com
OS	Windows 7 and up / Mac OS X 10.8 and up
CPU	Dual core CPU or higher
RAM	4GB
Browser	WebGL enabled
Free space	3GB (for Fuse)
Minimum browser resolution	1920 x 1080

Summary

Features 4.5 stars
Performance 4 stars
Design 5 stars
Value for money 5 stars

Verdict

4 stars

A great rigging solution for standalone characters and projects, especially while its free!

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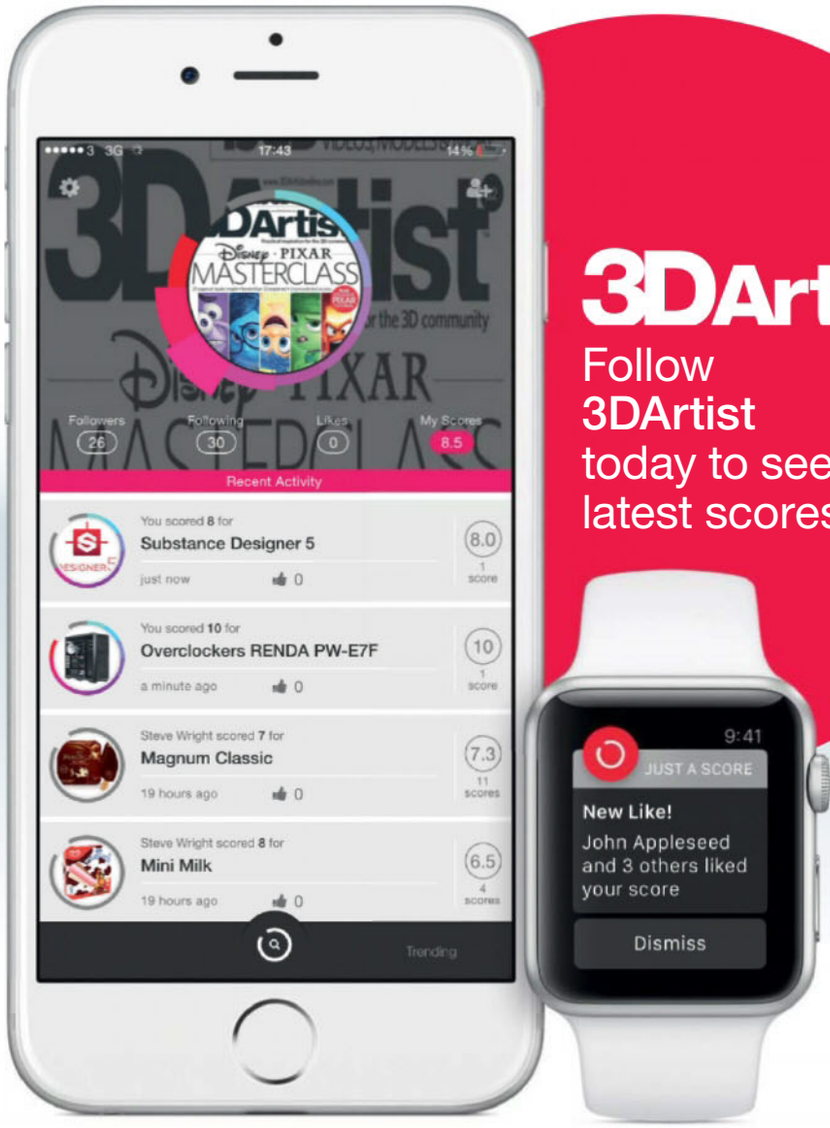

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The Hub

The inside guide to industry news, VFX studios, expert opinions and the 3D community

> "The challenge with any optical motion-capture system is creating a camera setup that can track the markers as accurately as possible"
>
> **Mick Morris,** MD of Audiomotion

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The winners of Humster3D's Ancient Rome challenge give us their tips and we speak to the winners of the recent CGTrader Sci-Fi Challenge

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The latest images created by the **3dartistonline.com** community

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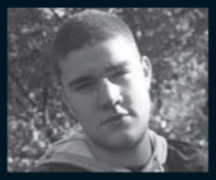
The most interesting thing for RStyle was to balance the creation of two different civilisations. "The ancient masters used the golden section a lot... I studied Italian paintings of the 15th Century, which are very impressive in terms of composition and light"

Humster3D Ancient Rome challenge

The ancient world of Rome proved a fertile topic for the 3D community, and so we spoke to the winning entrants of Humster3D's latest competition

Humster3D was looking for atmosphere and a strong idea, as well as an absence of any glaring mistakes of physics or anatomy when it came to this recent Roman-themed challenge, but apart from that, entrants were free to render as they wished. The results were certainly varied! Here we get a quick look at how the winning entries were created.



FIRST PLACE
Sergey Smereka (RStyle)
Restoration, 2015

- Focus on the idea. Don't be too serious about the work. Make a joke or something that is extraordinary about the topic of a competition. Do something unexpected. Here, the idea to add contemporary construction elements came only in the last few days.

- With composition, pay a lot of attention to the main composition of the shot. I went through a ton of old paintings to find the balance of the geometry and light.

- Work on the foreground. When you have many details in terms of textures and geometry in the foreground of the scene, the rest of your image will look very detailed too.

- Make time for postprocessing. Using things like colour correction and ZDepth pass can change the overall impression a lot.

avxhome.se

Luis Lara Osorio has been working on 3D projects since 2002, but it was not until last year when he and his friend Oriol Folch founded G24 Studio, a small studio specialised in 3D art. See **g24studio.com** for more

SECOND PLACE
Luis Lara Osorio
Conspiracy, 2015

- In this kind of project I think the most important thing is the idea, even more than the technical quality of the scene. But it must be well executed. You need to keep the main objects properly illuminated and positioned, trying to achieve a powerful and eye-catching image no matter how simple the scene.
- As the characters are cartoons, there's no need for realistic proportions or a good amount of details, but they must be expressive.
- The point of view lets you see lust and ambition clearly, and the main light source is low, giving the image a dramatic feel.

For Maciek, the one boring part was modelling the harness with details like stripes, buckles and so on, "I also don't feel very comfortable with characters, but this time it went quite smoothly. Hair for the horses and helmet were done with Blender Hair Particle System"

THIRD PLACE
Maciek Ptaszynski
Circus Maximus, 2015

- I use Blender for almost all 3D tasks like modelling, rigging, texturing and so on. For rendering I used Maxwell Render with B-Maxwell. I thought the competition would be a good opportunity to learn Maxwell.
- The hardest part for me was to pose the horses and to find a good angle for the image. I did hundreds of tries even when the modelling was not completely finished.
- I like to start lighting and shading the scene even if the modelling is not completely finished. This helps me to create and modify the concept in my mind.

CGTrader 3D Sci-Fi challenge

Always popular, this CGTrader competition is a great way to tackle tech and embrace the unknown

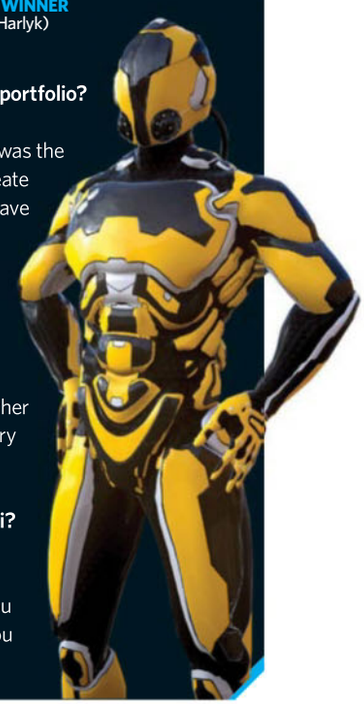
BEST MODEL WINNER
Johan De Leenheer (IterateCGI)
Faucer Fuga-MX230E, 2015

How did you create the winning model?
I used 3ds Max parametric capabilities with Graphite polygonal modelling tools and 3D-Coat for carving out forms, and finally it was rendered with OctaneRender.

What were the main challenges?
I set forward design challenges that would characterise this spaceship design; it needed to have a visible base frame with modular features (like a motorcycle) and a well-balanced distribution of shapes and details.

What do you do for a living?
I'm a freelance computer graphics artist and you can view some of my work at **cgtrader.com/iterateCGI** and on my website **crea-zone.com** too.

BEST PORTFOLIO WINNER
Dennis Jacobsen (Harlyk)
Sci-fi Trooper, 2015



How did you assemble your portfolio?
I used ZBrush to create the models. The main challenge was the idea and the time I had to create them. I am a hobbyist and I have two little children so I have just two to three hours in the evening for my models...

How did it feel to win?
It's a great honour and a big motivation. Now I see that other people like my work I will carry on and hopefully get better.

What do you like about sci-fi?
Sci-fi is great because everything is possible. It doesn't matter which way you wanna go, sci-fi is the way you can do it.

Mixamo CEO Stefano Corazza founded Mixamo as a spin-off from Stanford University's BioMotion Lab

Adobe votes 3D for CC

The company's acquisition of Mixamo will bring 3D functionality to Photoshop like never before

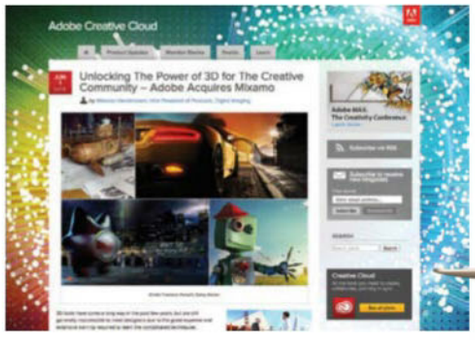
Adobe had already provided official Photoshop CC support for Mixamo – a service which lets users create, automatically rig and animate their characters online – last year, but now it seems the company has gone even further than before by buying Mixamo altogether.

"3D tools have come a long way in the past few years, but are still generally inaccessible to most designers due to the great expense and extensive training required to learn the complicated techniques," said vice president of products, B Winston Hendrickson in an Adobe blog post announcing the acquisition. He continued with confirmation that Mixamo's technology will mean Photoshop is set to gain many more 3D features in the future. Through the integration, Photoshop users will be able to create, customise, rig and animate 3D content, as well as take advantage of tens of thousands of high-quality turnkey 3D models, starting with stock characters that can be easily pulled into projects. Adobe is expected to implement more 3D design-led features in the future.

Creative Cloud 2015

All of Adobe's desktop and mobile apps are being updated with either new technology or new features in this year's evolution of CC. Photoshop is getting Artboards, the Dehaze tool to add or remove haze from photos, Blur Gallery filters that can now match the grain in an image, faster repair tools, a Panoramic Content-Aware fill and more.

Due to Adobe having acquired Fotolia for $800 million (£516 million) earlier this year, users will also be able to search through over 4 million stock images straight from Photoshop.



Learn more about Adobe's acquisition of Mixamo at **blogs.adobe.com/creativecloud/unlocking-the-power-of-3d-for-the-creative-community**

Apple to leap forward with rendering

The firm potentially jumps ahead of Khronos Vulkan with Metal

After first introducing it as a feature for iOS 8 in 2014, Apple has announced at its WWDC 2015 conference that Metal, a core-level graphics technology which combines OpenCL and OpenGL into a unified API, is now going to be fully integrated into the company's upcoming OS X release, El Capitan.

Metal will make use of a new shading language that is based on C++11 and implemented via Clang and LLVM. It will deliver system-wide performance gains; games and pro apps will be able to tap into the full power of Mac graphics processors providing up to 50 per cent potential reduction in system-level rendering.

This is amazing news for game developers, who now have access to a streamlined API, precompiled shaders, support for efficient multithreading to reduce CPU load and an improved battery life to take their games to a new level of performance.

Metal is not just good news for games, though. The performance boost it gives can also make a big difference in other graphics-heavy software. During testing with After Effects, for example, Adobe announced a notable eight times improvement in rendering.

Learn the fundamental concepts of Metal at **developer.apple.com/metal**, or discover more about OS X El Capitan at **apple.com**

HAVE YOU HEARD? Rainmaker Animation Inc has begun production on a reboot of *ReBoot*, the world's first fully CG TV show

Unreal Engine challenge launched

The popular real-time architectural visualisation competition from Ronen Bekerman returns

Anyone interested in creating photorealistic arch-vis or game environments could stand to win big money this summer, with over $60,000 (£39,000) in prizes including a $25,000 (£16,000) grand prize for group entrants and a $12,500 (£8,000) grand prize for individual entrants up for grabs in Ronen Bekerman's sixth architectural-visualisation challenge, The Vineyard.

Epic Games has been announced as the official sponsor to the 2015 challenge, so competitors will need to build their entries exclusively in the now free, powerful Unreal Engine 4. Official submissions will take place on a dedicated forum at ronenbekerman.com, and Epic support is available at forums.unrealengine.com. The challenge will run until the 15 September, with winners announced at the State of Art Academy in Venice on the 2-3 October.

Full details on the challenge will be available on **ronenbekerman.com** and **unrealengine.com**. ©GH House Interior by Bertrand Benoit

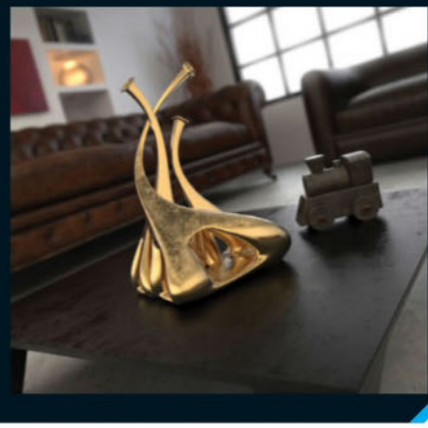
"Sharing info and building networks is what helps artists band together," said Andre Luis, founder of THU. Learn more and buy tickets at **trojan-unicorn.com**

Luxion unveils KeyShot 6

Features are focused on speed and simplicity with new lighting presets and more

KeyShot 6 is set to be an exciting new update for the physically correct rendering engine, designed to improve workflow efficiency with multilayer PSD output as well as a host of other expanded features like real-time region rendering and much more.

"As an avid KeyShot user since version 2, I feel this is the next big step for this amazing rendering program," reported concept designer Vitaly Bulgarov. "The huge addition for me is the Interior lighting mode. Even if you're not planning on doing architectural visualisation, you'll appreciate the interior optimisation for those product shots where lifelike daylight with graphics can cast shadows produced from the surrounding environment if needed."



KeyShot 6 will be available for users this summer, with pre-existing KeyShot 5 customers getting a free upgrade. See a preview at **keyshot.com/keyshot-6**

THU TV tickets announced

The increasingly popular artist-led festival has sold out, but can still be watched via THU's TV channel

The five-day festival for digital artists described as a 'digital art rave' has been getting more popular every year, but now Trojan Horse Was a Unicorn organisers have announced that even creatives who don't get to go to Portugal to attend the festival can still participate through THU TV. A paid channel, THU TV will broadcast the entire September event 24 hours a day for all five days.

"THU is moving from 'The Little Engine That Could' to a full-blown community that incites passion all around the world," said Scott Ross, THU ambassador and former CEO of Digital Domain. "Artists fly in from all over just to be a part of it, and this year, Trojan Horse Was a Unicorn is unveiling even more ways to get involved."

Along with keynote speakers Scott Ross and Craig Mullins, speakers at the conference include Ian McCaig, Alberto Mielgo, Shane Mahan and more, with workshops and presentations to propel artists to the next level.

Software shorts

Bringing you the lowdown on product updates and launches

V-Ray 3.2 for 3ds Max

Now compatible with 3ds Max 2016, Chaos Group's latest V-Ray 3.2 adds VR rendering capabilities, two new VR cameras and multiple V-Ray RT GPU enhancements. The free update for 3.0 users will also include improved volume rendering, distributed rendering and global illumination algorithm improvements. Learn more at **chaosgroup.com**.

The Multi-Eye ZTool

Developed by well-known CG artist Pablander, the Multi-Eye ZTool is a completely free ZBrush plugin that enables users to quickly and easily create different eye types for characters and creatures. The RAR file on **pablander.selz.com** contains the ZTool as well as a quick guide to set up the tool and a reference video guide in HD.

Non-Photorealistic Rendering 2 Kit

The Foundry's latest kit for MODO 801 and 901 lets users easily create a range of hand-drawn looks when rendering, resulting in stylised, expressive results that suggest traditional illustration. Effects include Toon Shading, Stippling, Halftones and Edge Rendering. Buy the kit at **thefoundry.co.uk/products/modo/kits/npr**.

DID YOU KNOW? All of Disney's studio shorts will be released together for the first time in August as a disc collection

Audiomotion Studios

The top mo-cap outfit shows off its horse capture skills with Exodus: Gods And Kings

Description Audiomotion is a performance capture studio with 160 Vicon cameras and 21,000 square foot of space. The team has delivered world-class animation for feature films, videogames, TV and commercials since 1997

Website audiomotion.com

Location England

Project *Exodus: Gods And Kings* (Equestrian motion capture for action sequences)

Client Double Negative, MPC, 20th Century Fox

Software Vicon Blade, Audiomotion Live, MotionBuilder, Maya, Alice

Contributors Mick Morris (MD of Audiomotion), Lindsay McFarlane (VFX coordinator on *Exodus: Gods And Kings*)

Portfolio Highlights

2013 *World War Z*
2008 *The Chronicles Of Narnia: Prince Caspian*
2006 *Citroen Skater*
2000 *Robbie Williams' Rock DJ*
2000 *Gladiator*

Exodus: Gods And Kings images © 20th Century Fox

Having worked with Ridley Scott on *Gladiator* way back in 2000, Mick Morris says that working on the director's latest project, *Exodus: Gods And Kings*, was like "coming full circle". He goes on to explain that "the technology has moved on but the challenges become ever-greater. How do you create tens of thousands of convincing digital horses?"

Audiomotion was well placed to meet that challenge, as it has a strong history of equestrian motion capture, its first being a shoot in 2001 with only 14 cameras. The biggest challenge before *Exodus* was *Prince Caspian*, where there "was rarely more than one horse and rider in the capture volume at any one time". For *Exodus*, Audiomotion had to be able to capture eight horses, harnessed into teams of two, hooked up to chariots and with two stunt performers on top. "Pretty daunting stuff," Morris says, "since the challenge with any optical motion-capture system is creating a camera setup which can track the markers as accurately as possible."

Having the horses hitched so closely together was a big part of the challenge. Morris explains: "The horses needed a specific suit design which we tailored for every animal. We then placed 70 markers on each animal, 60 on each stunt performer and 40 on the chariot, wheels and props. So approximately hundreds of markers, travelling at speed, through a very large volume. At times there were centimetre gaps between the animals."

The solution, which Audiomotion engineered with the MPC team, was "to design and build a unique 150-camera system which could track this number of markers at relatively high speeds. A lot of work went into calculating the size of the volume including factoring the speed of travel of the fastest horses when attached to the chariots. Space is needed for acceleration from a standing start and of course slowing to a stop from maximum speed. Another key element to this plan working smoothly was in the design of the truss system from which we would hang the cameras." This truss covered 13,000 square foot, with the "capture volume covering a total area of 4,300 square foot. This covered the turning circle for the teams moving at speed."

Audiomotion shot with horses for a full week, and then did another week of "stunt and crowd work for both Double Negative and MPC's crowd systems, whereby tens of thousands of digital extras were created. MPC built three armies; Hittites, Egyptian and Hebrew. As well as armies, the builds included Egyptian civilians, hero horses and digidoubles of Moses and Ramesses II." Both companies used Audiomotion Live to make selections after the shoot, with capture and clean-up in Vicon Blade through MotionBuilder to Maya.

But filling the studios with stampeding horses isn't all Audiomotion does. Morris recently went to the premiere of *Pourquoi J'ai (Pas) Mangé Mon Père*, the first full-length animated feature the company has worked on. Morris says it was "a lot of work over two months of shooting but the end result – the movie – is a lot of fun."

01

05

> Pretty daunting stuff, since the challenge with any optical motion capture system is creating a camera setup which can track the markers as accurately as possible
>
> **Mick Morris,** MD of Audiomotion

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01 Serious space was needed so the horses could accelerate and decelerate safely

02 "*Exodus* was the second time of capturing equestrian motion with [Audiomotion] and we'd raised the stakes by asking to capture pairs of horses galloping side by side pulling chariots," says VFX coordinator Lindsay McFarlane

03 Vicon Blade, Audiomotion Live, Motion Builder, Maya and Alice were all used in *Exodus*

04 Horse capture has become a speciality of Audiomotion's, but previous projects were not on the same scale as *Exodus*

05 Audiomotion also worked on *World War Z*, which Mick Morris calls "great fun"

06 "From the first production meeting at Double Negative we knew this was going to be something very different," said Mick Morris

01

Images of the month

These are the 3D projects that have been awarded 'Image of the week' on 3DArtistOnline.com in the last month

01 Dragon
by Gordei Krasnov
3DA username
Gordei
Gordei says: "I always wanted to come up with my own dragon design. It's a classic design, so there wasn't much room for big changes or any painstaking work on the established rules."
We say: *Gordei's image really leapt out at us – it's a brilliant rendition of a typical dragon and looks pretty fearsome. The big globules of saliva in the mouth add to the realism.*

02 Livingroom
by Daniel Reuterswärd
3DA username
daniel.reutersward
Daniel says: "This is a personal project created with 3ds Max, Corona Renderer and Photoshop. It started as inspiration from stylist Hans Blomquist but slowly changed to my own design."
We say: *This is a great example of interior arch-vis – superb modelling, texturing and composition. It's our image of the month because of the incredible lighting and reflections.*

03 Rainy Day
by Vahid Montazeri
3DA username
bbbb5331
Vahid says: "I modelled the Ford Mustang GT500 and rendered it in the rain. The modelling was completed in 3ds Max and rendering was done in V-Ray. I hope that you like it!"
We say: *Vahid has done a great job in creating an atmosphere for his scene while still paying considerable attention to the crispness and authenticity of his vehicle model.*

04 Villa In England
by Nguyen Thanh Vich
3DA username
Vicnguyendesign
Vic says: "Here is the project Villa in England. It was a deserted mansion and I was invited to modify it. The project gave me great inspiration, which I expressed in CGI."
We say: *We've seen a few houses just like this here in the UK! This is a great example of classical arch-vis, using something traditional rather than conceptual as inspiration.*

03

Image of the month

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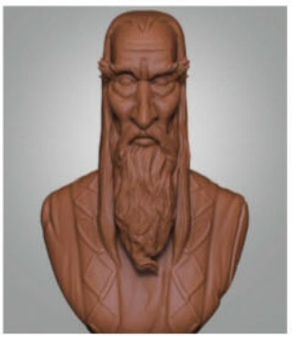

Tribute to a Wizard

by Rafael John R Regidor
3DA username flamedidea
Rafael says: "A tribute to Christopher Lee. It started as a daily speed sculpt, but I decided to push the details further and turn it into a final piece."
We say: *We were extremely sad to hear of the passing of such a wonderful actor with such an illustrious filmography back in June. Rafael's tribute is a fitting one and an excellent bit of sculpting, too.*

Hamburguesa **by Omar Dujarick**

3DA username Dujarick
Omar says: I created this with Maya, Arnold and Evermotion gallery models. Textures and maps have all been modified. The postproduction work was done in After Effects and Photoshop."
We say: *We picked this when we were very hungry, for obvious reasons. Omar's burger image looks absolutely delicious and is well textured, too.*

Astrobot **by Maipai Suppaudom**

3DA username Krit Suppaudom
Krit says: I'm very excited every time I create robots and mechs. I'm interested in the detail, material and texture of this image. These things are really enjoyable for me ."
We say: *This is the second time we've featured Krit recently, as his mech designs always stand out. We love the reflectivity of the armour and the choice of colour works really well.*

Le Morne **by Terri Brown**

3DA username BROWN T-POT
Terri says: "Fully made with CGI, this home in the shadow of the famous Le Morne Brabant mountain in Mauritius was designed by Eric Chavoix Architects to naturally blend into the landscape and provide exceptional views over the bay."
We say: *This image is serene and idyllic, and the composition is a particular highlight. Yet another excellent example of lighting and well-executed reflections.*

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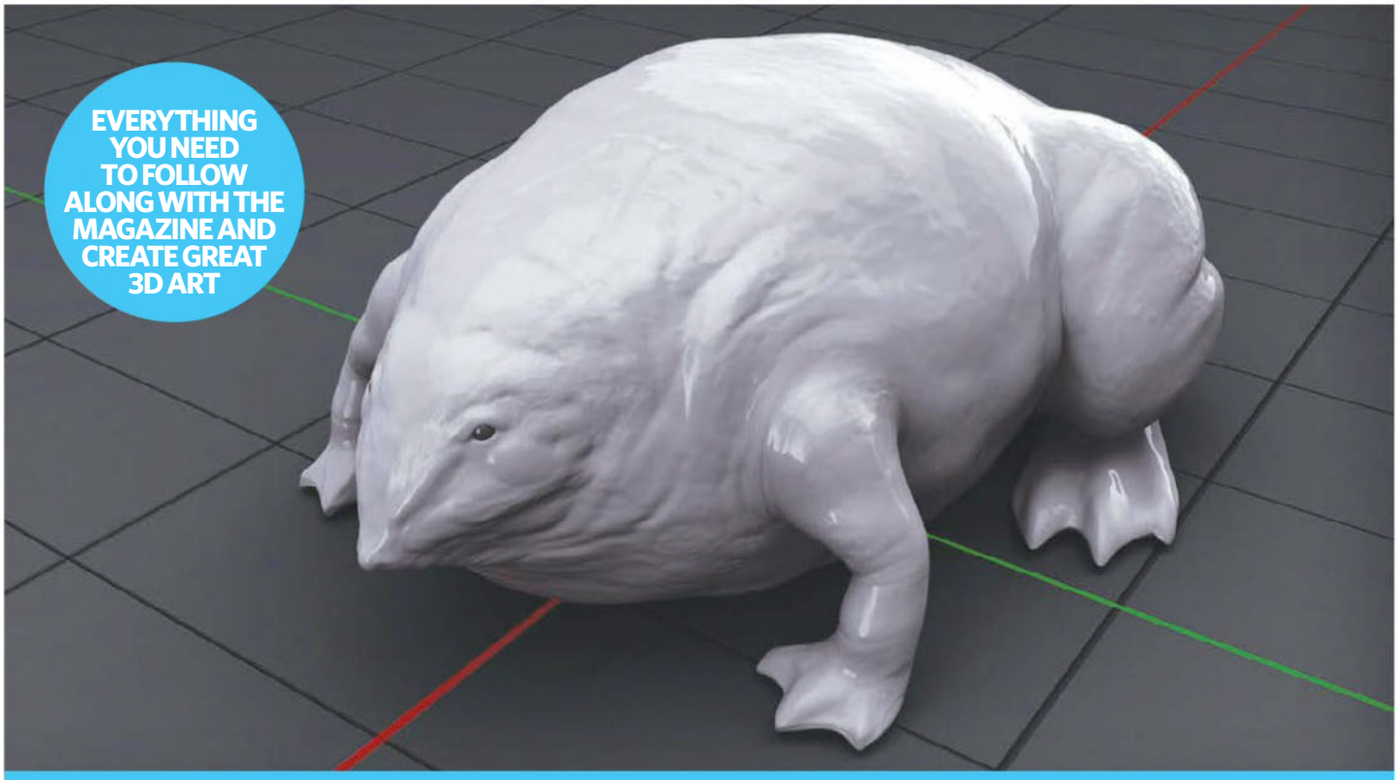
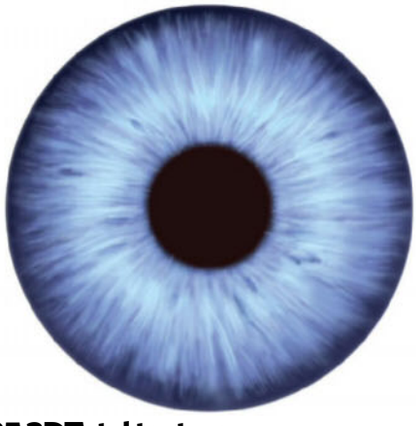


SCULPTING WORKFLOWS IN BLENDER



25 3DTotal textures

CGAxis models

THIS MONTH'S COMBINED RESOURCE SIZE: **8GB**

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- 25 awesome 3DTotal textures
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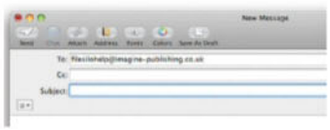
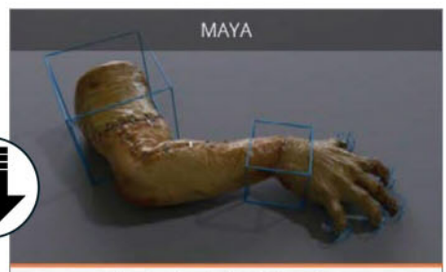


Master still life in Blender

Reynante Martinez reveals his incredible photorealistic still life workflow in Blender and...

Awaken a ZBrush beast

Included here are images to accompany James Suret's fantastic creature sculpting tutorial....



Rig a hand using Set Driven Keys

In part two of Jahirul Amin's superb rigging masterclass he explains how...

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Having trouble with any of the techniques in this issue's tutorials? Don't know how to make the best use of your free resources? Want to have your work critiqued by those in the know? Then why not visit the **3D Artist** Facebook page for all your questions, concerns and qualms? There is a friendly community of fellow 3D artists to help you out, as well as regular posts and updates from the magazine team. Like us today and start chatting!

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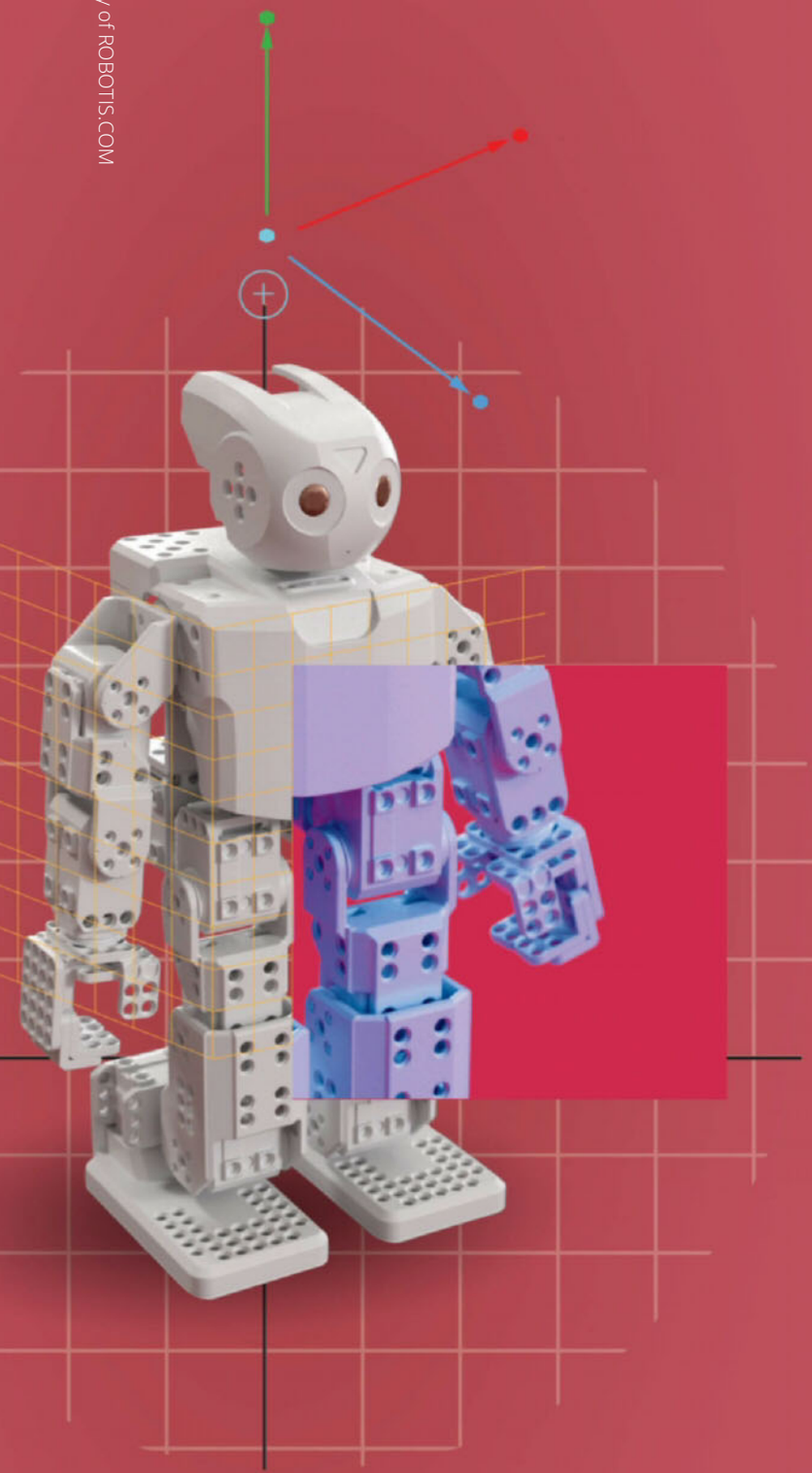
THE FOUNDRY.

Image courtesy of ROBOTIS.COM



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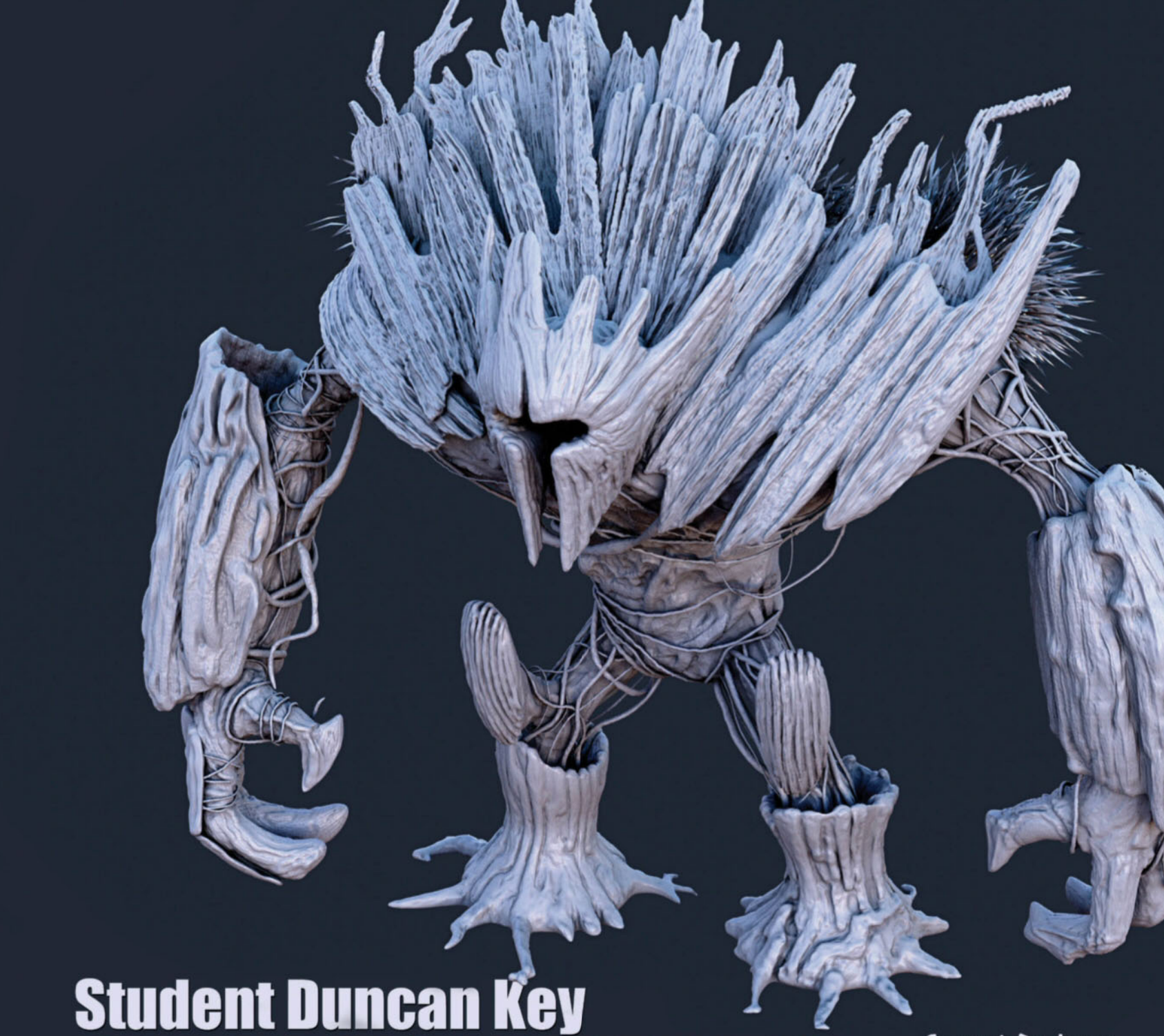

Student Duncan Key
MADE THIS IN WEEK 10!

Concept Designer
Grant Gosler

We're not sure which is cooler, the fact that Duncan made this in the 10th week of DAVE School (with no prior training) or the fact that this was the second ZBrush project assigned to his class! Our students benefit from being assigned carefully planned projects with expert instruction so they are doing amazing work right out of the gate!

They are provided with world-class designs from notable concept artists and shown professional techniques, but how they use their newly acquired skills is entirely up to them. The DAVE School never provides step-by-step instruction, we push the student to find their own way through a challenge, just like they will when they go to work at a studio.

And while we are proud of Duncan, he's by no means the only one. Check out our student galleries and you will see page after page of consistently great work from a wide variety of students! Our modeling program is common to both our 12-month **VFX Production** program and our 15-month course in **Game Production.**

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